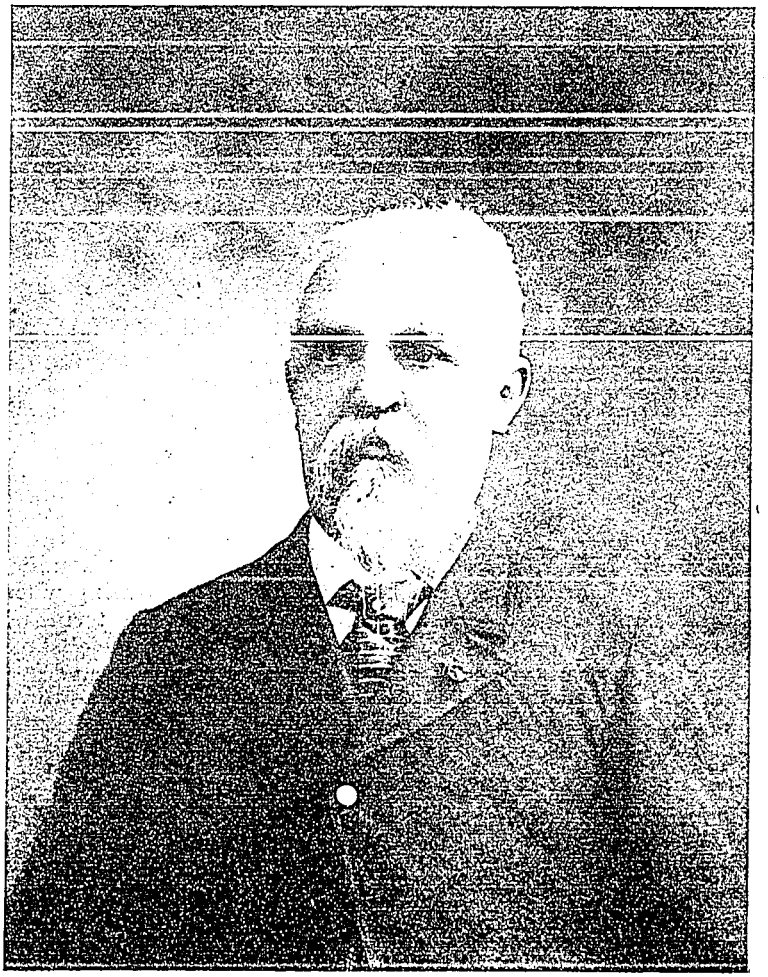
THE HAWAIIAN PLANTERS' MONTHLY

PUBLISHED FOR THE

HAWAIIAN SUGAR PLANTERS' ASSOCIATION.

Vol. XXI] HONOLULU, JUNE 16, 1902. [No 6



F. A. SCHAEFER.
President of the "Hawaiian Sugar Planters' Association."
For the year 1895 and 1901.

NEW YORK SUGAR MARKET.—Refiners are paying 3½c. for 96 test centrifugals; 2¾c. for 89 test muscovado, but offerings are not liberal. The demand for refined is good, with list unchanged, or 4.70c. for standard granulated.—May 20.

Cuban planters have finally become discouraged as to receiving any concessions from Congress in season to afford them help on the present crop and letting their sugars go more freely, or else, instead of planters, the bankers, as that class of holders of sugars, who have made advances to the planters may be forcing sales to secure themselves against advances made, without protecting the planters to any longer time, in view of the delays of the situation. Several causes combined are now leading to the disposition of the Cuban crop upon a much larger scale than heretofore. Of course, every sale made is at a very heavy loss to its owners and will cripple them in the production of the next crop which, under present conditions and outlook, is likely to be largely curtailed.

Coffee: Its History, Classification and Description.
Tea: Its History and Mystery.
Tea Blending as a Fine Art.

These three books are all by Joseph M. Walsh, and the price is $2 for each book. They are practical, useful handbooks for every dealer in tea and coffee. The author has spent most of his life in the tea and coffee trade, and has a practical knowledge of his subject. The different sorts of tea and coffee known on this market are described in detail. The publishers are H. T. Coates & Co., Philadelphia.

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GERMAN BOUNTIES.—A correspondent of the "London Times" reports as follows: "A Bill of four clauses dealing with the sugar taxes and bounties, in accordance with the terms of the Brussels' Convention, has been laid before the Reichstag. The bounties are abolished and the economies thus effected are devoted to reducing the inland revenue tax on the consumption of sugar from 20 marks to 16 marks per 100 kilogrammes. The memorandum which accompanies the Bill, explains that if the Convention were not carried out Great Britain would undoubtedly adopt an extreme policy of the reprisals against the bounty system. The differential treatment of German sugar by British India and by the United States would be untensified, and even assuming that a tariff war had a favorable issue, the German sugar industry would be seriously injured. The memorandum states that Great Britain has undertaken not to favor by direct or indirect methods the importation of sugar from her own colonies, including the West Indies. She will also adopt measures for the regulation of her sugar factories, which will have the effect of abolishing the present advantage accorded to raw sugar. It is anticipated that the United States and British India

will, in consequence of the abolition of bounties, abandon their differential treatment of sugar imported from Germany; in fact, an express undertaking with reference to British India was given at the Brussels' Conference. According to the memorandam there is absolutely no fear that cane sugar can ever compete with beet-root in the European market. Finally, the memorandum strongly condemns the German Sugar Kartel, which, in order to obtain an extra profit of from three to four marks per 100 kilogrammes for its members, has raised the price of sugar for home consumption by nearly four times that amount. The result has been a serious decline in the home demand, upon which the future prosperity of the German sugar industry entirely depends."

CZARNIKOW'S REPORT SAYS: In British India, where countervailing duties against States bounties have existed since March, 1899, an additional duty has just been imposed as a set-off against Kartel bounties, and the effect of this will be to shut out German and other continental refined from India.

The United States might well follow the example of India in countervailing Kartel bounties as they already do State bounties.

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BICYCLES AS ROADMAKERS.—A great factor in the development of good roads is the bicycle. The bicycle has become as much of a necessity as any wheeled vehicle for carrying passengers. The wheelmen are vastly more numerous now than those who own buggies, consequently they are more interested in seeing that we have good roads. It is hoped that the good roads movement that is spreading in every direction will continue to grow until it will be possible for a wheelman or a horse and buggy to travel from one end of the state to the other, or across from east to west in any tier of counties and be able to travel on good roads all the time. This can be accomplished in the course of years if the improvements that are being made now are substantial ones. In some states the county commissioners are paying one-half of the expenses and property owners are paying the other half. This plan seems to be a very satisfactory one and should be the means of making many miles of good roads.

The London Daily Mail, in a statistical review, places the United States at the head of the great nations in wealth, and the lowest in the list with respect to national debt, as shown in the following table:

	Wealth.	Debt.	Per cent.
United States	£16,350,000,000	£ 221,000,000	1.4
Great Britain	11,806,000,000	706,000,000	6.0
France	9,690,000,000	1,239,000,000	12.3
Germany	8,052,000,000	651,000,000	8.1
Russia	6,425,000,000	711,000,000	11.1

The weather for the past few months has been very favorable for cane, and the prospects are good for the largest annual yield of sugar on record in Hawaii.

The volcanic eruptions in the West Indian group, which have resulted in great loss of life and destruction of property both on the land and sea are only a repetition of what has occurred, though somewhat rarely, in the world's history. Every volcanic center is exposed to these lava flows and showers of hot ashes, even though the crater may have been dormant for centuries. It is very probable that there is a constant and tremendous internal pressure against the earth's crust by the pent-up forces, which are always in more or less activity, and when this pressure becomes so great as to force an opening through an old or new chimney, the explosion is most terrific, and often accompanied with loss of life and property, as has recently been the case in the West Indies.

The Hawaiian group is fortunately not so liable to suffer from destructive earthquakes or lava flows, as it has an open vent or chimney at Kilauea, through which the explosive gases can and do escape without serious harm to life or property. Historians of Hawaii, however, tell us that there have been eruptions on that island in which many lives were lost. One of these occurred in 1790, while a Hawaiian army was encamped a few miles south of the crater of Kilauea. It was a shower of black sand, which probably came from Mauna Loa, and buried the army very much as the inhabitants of St. Pierre were buried and suffocated with the ashes and sulphur fumes emitted from the volcano. The similarity of the two disasters is quite remarkable, and it is fortunate that they occur very rarely,—once in a century or longer period.

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RUSSIA'S EASTERN EMPIRE.

Few of our readers are aware of the rapid changes which the Siberian railway across Asia is making. What was once a vast and almost unexplored portion of that continent, is now being opened to commerce and travel, and each year will witness an increase, as plans mature for attracting settlers along the new road. At present there are but three ports where commerce and travel are admitted—Vladivostock, Port Arthur and Talienwan or Dalny. These cities have had a rapid growth during the past two years, assisted largely by the Russian government, and every effort is being made to attract commerce thither.

Regarding Dalny, it is said to be one of the finest deep-water harbors of the Pacific, as it is free from ice, and ships drawing 30 feet can enter at low tide without any difficulty and, even without the aid of a pilot, sail or steam up alongside

of immense docks and piers, well protected by breakwaters, where their cargoes can be loaded directly into cars that run direct for 6,000 miles or more to the great city of St. Petersburg. The surface of the bay comprises many miles, and the deep-water area is sufficient to handle the shipping of all China. The port is to be absolutely free, as no custom house is to be established. Even the moderate rates of Chinese customs will not be charged on goods landing or to be exported thence. Tonnage dues, dock charges, and wharfage and warehouse charges will all be maintained at the lowest point, with the view to encourage and develop commerce. All of these features will be modeled on the methods of Japan.

The account says that one of the most serious drawbacks to American trade in China and throughout the Orient is the limited number of citizens of the United States to be found there. While we have a greater variety and quantity of products fitted to this market than any other country, American trade is restricted because of the limited number of citizens represented. Great Britain has about ten citizens here to one American, and nearly all are trades people. Germany is pushing her commerce with much success by establishing mercantile houses in charge of Germans.

The real need of America all over the Orient is the presence of merchants who are citizens of our country, familiar with its products and business methods. There is no country doing as large a share of the trade of the Orient with so small a percentage of citizens as the United States. This shows our great natural economic advantages and the splendid opportunities we have here for trade. The banks of China support the native merchants; and with modern steamships to bring cargo, and modern banking facilities, the handling of the business should not be a heavy financial burden. The commercial town of Dalny offers a splendid opportunity for the establishment of new business enterprises on the part of our citizens.

These statements taken from U. S. Consular reports will show the progress being made now, and the attractions that are held out by our Western neighbors to those who have the capital and enterprise to engage in a new land.

A Yankee named Enoch Emory went to Siberia from Cape Cod some years ago. He was the pioneer American merchant, and now has stores in several large cities. He has increased the working force of the Amur territory 20,000 men by the introduction of American labor-saving machinery. Most of the supplies under the head of emigrant stores are furnished to the local government by him. American agricultural machines have enjoyed such an established reputation that it has long been a paying business to imitate them. The complaint now is that many cheap and inferior machines, mostly made in Germany from American models, are on the market. Since

the retaliatory tariff took effect, February 7 (20), 1901, many American machines come via Germany, it is asserted; all American marks being carefully obliterated.

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THE CABLE TO AUSTRALIA.

Under date of November 29, 1900, U. S. Consul-General Bray, of Melbourne, writes: The postmaster general of Victoria announces that the tender of the Telegraph Construction and Maintenance Company, of London, has been accepted for the laying of the Pacific cable, at a cost of £1,795,000 ($8,735,367), the installation and surveying to cost £204,000 ($992,766), making a total cost of the cable when completed of £1,999,000 ($9,728,133). The cable is to be completed and in working order by the 31st of July, 1902, provided the company is allowed to start laying the Australian section first. The Australian section comprises cables from the New South Wales and New Zealand coasts to Norfolk Island and thence to Fiji. The other section will be from Fiji to Fanning Island and thence to Vancouver, British Columbia.

The route decided upon is from Vancouver via Fanning or Palmyra Island, Fiji, and Norfolk Island, with branches from the last-named station to Auckland, New Zealand and Queensland. The length of the cable over this route would be, allowing 10 per cent for "slack" actually used, 7,986 nautical miles, viz: Vancouver to Fanning Island, 3,561 miles; Fanning Island to Fiji, 2,093 miles; Fiji to Norfolk Island, 961 miles; Norfolk Island to New Zealand, 537 miles; and Norfolk Island to Queensland, 834 miles. Some 1,900 soundings over 500 fathoms in depth have been made, which relate directly to the route along the bed of the ocean, the greatest depth being 3,200 fathoms, but the general average much less.

It is estimated that with the use of 650 pounds of copper and 400 pounds of gutta-percha, 1,940,000 words might be transmitted in a year. Great Britain and Canada have agreed to defray five-ninths of the total cost; New Zealand, one-eighth; and New South Wales, Queensland and Victoria have pledged themselves to contribute the remainder between them.

As to the revenue to be derived from the cable, it is anticipated that the returns for the first year, on a tariff of 2s. (49 cents) a word, will be £109,807 ($534,376), and that by the fourth year of its working the cable will become a paying concern. It has been proposed to charge 3s. (73 cents) a word for messages right through—that is, crossing Canada and the Atlantic, in addition to the Pacific—and 2s. (49 cents) for the Pacific cable section.

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THE CONSUMPTION OF SUGAR IN THE UNITED STATES.

Some data recently compiled by the United States Treasury Bureau of Statistics bring out vividly, says the Louisiana

Planter, the enormous increase in the consumption of sugar in this country. In 1870 the total consumption of sugar in the United States was about 566,000 long tons. In 1901, a lapse of 31 years, the consumption of sugar in the United States reached 2,365,000 long tons, more than four times the consumption of 1878, or 417 per cent of the consumption of 1870, or an increase in the consumption of sugar of 317 per cent in 31 years.

Of course a considerable part of this is due to the increase of population in the United States, but apart from that there has been a large increase per capita. In 1870 the consumption of sugar per capita in the United States was 33 pounds; in 1901 it was 68 pounds per capita, an increase of 106 per cent, or more than double. There is a belief extant and more or less well founded, that the actual consumption of food articles does not vary much from year to year because of price or from any other common cause. The distribution of food articles varies with prices, but the actual consumer of sugar, tea and coffee seems to desire and to get about the same daily ration, be the prices low or high. If there be any exception to this food article rule, sugar would seem to constitute that exception. The merits of sugar as a food stuff are now far better understood than 30 years ago and the use of sugar foods is every where encouraged as healthful and economical.

This may lead us to look ahead and to say that in 1931 our consumption of sugar will be 136 pounds per capita and that our country will then consume nearly five million long tons of sugar. This ought to give buyers for the cane sugar of the whole Gulf Coast, from Florida to Texas, as well as several millions of tons of beet sugars from the states of the great West and the Pacific.

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SEEDLING CANE D 95.

By A. Urich, Ph. D.

The experiment started there years ago by Major Grieg on the Brechin Castle estate in Trinidad in order to test the merits of the new cane seedlings "D 95," came to a conclusion this year by the cropping of the second ratoons.

A plot of 1¾ acres had been cultivated with the new variety side by side with the ordinary Bourbon cane under exactly identical conditions as regards tillage and fertilizers. The latter, which contained 40 per cent ammonium sulphate 13 per cent soluble phosphates and 8 per cent potash salts, was applied at the rate of 3 cwts. per acre. Previously six tons manure per acre had been applied.

The annexed comparative statement of the results obtained with the two varieties as plant canes, first and second ratoons, shows that the new variety maintained in every year its sup-

eriority in sugar contents with a small amount of glucose, but was inferior in tonnage, which accounts for the yield in sugar per acre being almost the same for both. As regards attacks by insects the sweeter cane, D 95, suffered most. It is somewhat less juicy than the "Bourbon" and takes a little longer time to grind, but has the great advantage of requiring from 100 to 300 gallons less juice per ton of sugar, which means a saving in fuel and labor.

Its main merit, however, consists in being a "quick ripener." Several truck loads of D 95 [plant canes only 9 months old] were ground on Feb. 7th and gave juice standing already 10.5 deg. Beaume [at 85 deg. F.] with 1.96 pounds sugar per imp. gallon and 1.16 per cent glucose. The price of the Bourbon cane ground on the same day stood only 9.1 deg. B. with 1.58 pounds sugar and 1.65 per cent glucose.

On the other hand, D. 95 appears to deteriorate rapidly when once maturity has been reached. It was surprising to find another lot ground on April 10th, giving juice standing only 8.3 B. with 1.47 pounds sugar per gallon and 0.94 per cent glucose. A third lot, from the same field, ground on May 3rd had juice of 9.5 B., 1.68 pounds sugar and 0.73 per cent glucose. These canes had been planted 20 months ago on lands that evidently did not suit the variety.

Should these observations be confirmed, then D 95 will require careful watching to prevent the deterioration of the canes. On the whole, the results of these experiments were encouraging enough to justify the planting of several hundred acres with this new variety.

Trinidad, B. W. I., Oct. 11, 1901.

COMPARATIVE STATEMENT OF RESULTS OBTAINED AT BRECHIN CASTLE ESTATE WITH D 95 AND BOURBON CANE IN 1889, 1900 AND 1901.

		1st.	2nd.		1st.	2nd.
	Plants.	Rat.*	Rat.	Plants.	Rat.*	Rat.
Canes obtained per acre—tons at 2240 lbs	35.45	24.93	27.63	37.34	29.72	31.19
Extraction in juice—single crushing	64.9%	63.7	67.5	67.5	64.2	68.5
Density of juice at 35 deg. F. Baume	10.5°	10.4	9.4	10.0	9.1	9 2
Sucrose—per cent	17.57	17.80	15.67	16.34	14.65	15.04
Glucose—per cent	0.36	0.75	0.76	1.70	1.47	1.75
Pounds sugar—per imp. gallon	1.90	1.94	1.67	1.66	1.57	1.61
Quotient of purity	90.1	92 3	89.6	87.8	86.2	87.9
Tons sugar, all grades, obtained per acre	3.65	2.57	2.65	3.72	2.57	2.90
Tons, canes per ton sugar	9.71	9.67	10.44	10 08	11.75	10.76
Imp. gallons juice per ton sugar.	13 10	12.83	14.80	14.14	15 86	15 48

*The first ratoons had suffered from drought.
Crop time: April of each year.

Note.—The Bourbon and Lahaina canes are very much alike, if not the same cane.—Mexican Sugar Report.

REPORT ON PRECAUTIONS TO BE OBSERVED WITH REGARD TO CANE IMPORTATIONS.

Submitted to the Hawaiian Sugar Planters' Association, May, 1902.

HONOLULU, H. T., May 9th, 1902.

To the Trustees of the Hawaiian Sugar Planters' Association.

GENTLEMEN:—The planting and propagation of new varieties of cane for experimental purposes, with the object of comparing their productive value with that of varieties already established constitute a line of investigation of considerable importance where such radical climatic and soil differences exist as we find on these Islands.

The sensibility of various canes to drought and excessive moisture, their respective adaptabilities to different elevations and exposures, and the draughts made by the same upon the plant foods of the soil, form questions the solutions of which may prove of material advantage to the Hawaiian sugar industry.

Cane variety experiments have been pursued for a number of years at your Experiment Station and much time and labor have been expended in the procuring and tabulation of data respecting the different tests. Seed from the more promising canes has been distributed among the plantations for trial under diversified conditions and we believe that results may be looked for of great economic value.

There is a danger, however, that unless a proper precaution is observed in the importation of these new varieties, the objects of such experiments may be defeated by the introduction of noxious insects and plant diseases from which these islands are now practically free. By a rigid examination of all consignments of cane, and with the thorough fumigation or destruction of suspicious samples, the cane fields of this country will be protected in large measure from the serious pests common in other cane producing countries.

Shipments of cane received at Honolulu are carefully examined, before leaving the wharf, either by Prof. Koebele, or in his absence by his representative, Mr. Perkins. Other ports of these Islands, however, can not take the same protective steps and stand liable to nullify all precautionary measures observed at Honolulu.

We would therefore suggest that plantations desirous of experimenting with new varieties of cane, obtain the same when possible from the Experiment Station, and in event of procuring samples from foreign sources, that such samples be imported through the care of the Experiment Station and carefully examined by your entomologist and passed or condemned as the case may be. It is only by the exercise of such

rigid measures that freedom from further insect troubles may be assured.

In the absence of Prof. Koebele, Mr. R. C. L. Perkins has at our request, kindly submitted a report on the insect enemies of cane on these Islands, and his observations and knowledge of the habits of Hawaiian fauna make his report of great value in the consideration of this matter, and but emphasizes the necessity of proper control of cane importations. Mr. Perkins' report we give in full:

HONOLULU, H. T., May 8th, 1902.

MR. C. F. ECKART.

DEAR SIR:—In answer to your letter of May 5th I will reply to your questions in the order in which you have stated them in that letter.

(1) What are the insects of an injurious nature already existing in these Islands?

The insects positively more or less injurious to cane together with one or two which are somewhat doubtfully so, are, so far as my personal knowledge goes, fifteen in number. Divided according to the classes to which they belong they are as follows:

Beetles— (1) The cane-borer (Sphenophorus obscurus).
(2) Long-horned beetle (Aegosoma reflexum).
(3) Small borer (Hypothenemus sp?).
(4) Nitidulid beetle (Haptoncus sp?).

Caterpillars— (1) Omiodes acepta and probably the very closely allied species.
(2) O. epicentra.
(3) The 'peelua' (Spodoptera mauritia).

Flies— (1) Four-banded fly (Fam. Ortalidae, perhaps Euxesta annonae).

Crickets, &c.—(1) Mole-cricket (Gryllotalpa africana).
(2) Short-horner grasshopper (Oxya velox).
(3) Long-horned grasshopper (Xiphidium fuscum).

Bugs— (1 and 2) Leaf-hoppers (2 species) (Fulgoridae).
(3) Plant-louse (Aphis sp?).
(4) Mealy-bug (Dactylopius sp?).

(2) Generally speaking in what manner do they affect the cane, and about what would you judge their relative injurious action to be?

The above listed species may be divided according to their mode of attack as follows:

(1) Boring in the stem, or eating or cutting the underground stem or roots—Sphenophorus, Aegosoma, Hypothenemus, Gryllotalpa.
(2) Eating leaves only—Omiodes, Oxya, Xiphidium, Spodoptera (the latter only on young leaves).

(3) Sucking juices, generally from leaves—Dactylopium, Aphis, and leaf-hoppers.
(4) Feeding on parts attacked by some of the immediately preceding species—Haptoncus.

By far the most injurious of these insects is the 'borer' wherever it occurs in numbers, and its work is of course well known to you. The long-horn beetle (Aegosoma) is of little importance, only attacking cane accidentally. Its natural food is the decaying wood of forest trees and it would at most be found for a few years on cane land, which has at no very long period since borne forest trees. In such situations the larvae might remain for some years eating cane only when driven by starvation or in search of suitable food. The Hypothenemus belongs to the same group of beetles as the notorious 'shot-borer' of the West Indies. I have only noticed it in refuse cane, especially such as has been partially burnt, but it might, if much of this were left lying, multiply to an excessive extent and then attack healthy plants, as is known to be the case with allied kinds of beetles.

The caterpillars of the two Omiodes feed on grasses as well as cane leaves. Consequently though extremely abundant their attack is spread over a very large area. Moreover, they are a favorite food of an abundant native wasp, which exists on the islands at all seasons in millions of individuals. Enormous numbers of these caterpillars must be destroyed by the wasps since each of the latter is bred at the expense of from four to a dozen of the former, and with a steady population of millions of wasps throughout the year there are evidently several broods of these hatched in this period. Should any bird or parasitic insect be imported which would diminish the numbers of or exterminate these wasps, I anticipate that the caterpillars would do excessive damage both to cane and pasture lands, the more so as on account of their habits they would be themselves little subject to the attacks of birds.

Unlike the caterpillars just mentioned, which will eat the leaves young or old alike, the well known 'peelua' feeds only on the very young leaves. Moreover it feeds unconcealed, while the others always hide themselves by fastening two leaves or two parts of a leaf together with silk, and live in the space between the two surfaces. Seeing that the 'peelua' is highly injurious to pasture land, occurring in countless thousands locally and at irregular intervals it is surprising that it has not come into greater prominence as an enemy of cane. It has been recorded as injurious to cane in these islands under the name of Laphygma frugiperda, which is a well known injurious species in America, but it appears to have been wrongly identified with that insect. The long and short-horned grasshoppers also eat the leaves of cane. The latter (Oxya) is recorded as an enemy of cane in Java also. Here it is chiefly to be found in cane at higher elevations or in wet dis-

tricts; in lower and dry localities its place is taken by the long-horned grasshopper, although the two may often be found together. The increase of the latter is quite remarkable. Introduced no doubt a year or two previously to 1892 in that year it was one of the rarest of the island insects, being found sparsely only in the Pauoa Valley. Now it is found throughout Oahu and is represented by millions of individuals. It is partial to corn, sorghum and various grasses as well as cane. The short-horned species had no doubt been introduced long prior to the long-horned, but it is nearly certain that it was not here 25 years ago, and it is worthy of note that another and very different short-horned species has been imported within the last few years and is now firmly established although not yet numerous.

The plant-louse and mealy-bug are certainly locally injurious, as they are found in great numbers together. It is noteworthy that whereas the latter, when attacking other vegetation, are easily kept in check by the imported lady-birds, this is not the case in the cane fields, where the bugs lie concealed at the extreme base of the laves, and appear to be inaccessible to their destroyers. Further observations are necessary on this point however, for if not inaccessible, the cane could probably be easily rid of these bugs by turning out quantities of the proper kinds of lady-birds in the field. The Nitidulid beetle breeds in the parts injured by these disgusting insects.

The 'leaf-hoppers' where present in excessive numbers must materially injure the cane. The eggs are laid beneath the surface of the thicker parts of the leaf and are placed, several together, in a small chamber formed by the ovipositor of the female parent. Their position is readily identified by the scar and discoloration at the spot where the leaf has been pierced. The young which hatch from these eggs leave the chamber and feed externally, often in great numbers together, by sucking the juices of the plant.

The excretions of the several preceding insects afford a suitable medium for fungoid growths.

The amount of injury done by many of the insects I have enumerated above is, as you will observe, quite problematical. In cases where without apparent reason (i. e., when soil, water supply, &c., are all satisfactory) the cane does not seem as vigorous as might be, it is possible that injury is done by some of the above named insects, which might easily escape notice, or injury may have been done at an early stage of the growth of the cane and the cause of its deterioration would not be evident in the mature crop.

(3) As regards the insect commonly called "leaf-hopper" can you give information concerning the period in which the different species were first noticed on these islands by you

on cane or other plants? Also do you believe these insects to have come to this country in cane importations?

Of the two species of 'leaf-hoppers' which are found in the cane fields one has certainly existed in the islands for more than 10 years and both may have done so. Unfortunately (the species being much alike superficially) I am not able to say whether specimens taken by me in the early part of my collecting in these islands belonged to one or both species. There is at present in the press a work on the island species of this group based on the material collected by me during the past 10 years which may be published any day and will probably furnish the information required. At least it is certain that the two cane-field species have been imported, for they have not the least resemblance to the many indigenous species, which frequent the forests and are peculiar to these islands. Whether these imported species are identical with any of the several species already known to be injurious to cane in other countries I have no means of deciding until the above-mentioned work is issued. An insect which appears to have much the habits of the leaf-hopper, with which you are familiar, is known in Java and as the specific name 'vastatrix' has been applied to it, I presume it is highly injurious. I think these leaf-hoppers are quite as likely to have been brought with other plants as with cane, since one at least is partial also to corn and some grasses.

(4) What are the most serious insect pests in other cane countries, specifying countries as far as possible?

It is, I think, safe to say that almost every country which grows cane extensively, has bad pests, which are at present quite unknown in these islands. Those chiefly to be guarded against are the various borers which might easily be introduced in imported cane. The word 'borer' has been applied indiscriminately to utterly different insects, so that the 'borer' of one sugar country often belongs to an entirely different class to that of another. Consequently the 'borers' may be divided into two classes:

A. Beetles, to which belongs the cane-borer of these islands. Allied to our cane-borer are (1) Calandra palmarum, West Indies, Queensland, Louisiana. (2) Rhyncophorus ferrugineus, Java. (3) Sphenophorus sericeus (=sacchari) the lady-bird borer of West Indies and British Guiana. With these may be included Xyleborus perforans, a minute beetle, the 'shot-borer' of the West Indies. We have many species of Xyleborus in these islands, both indigenous and imported, but none, so far as I know, that attack cane.

B. Caterpillars of moths, which should be called 'moth-borers'. To this class belongs the notorious Diatraea. The literature at my command does not enable me to determine the identity of the moth-borers of various sugar countries, but they are found in the West Indies, Java, Australia, Brit-

ish India, Louisiana, &c. We have nothing in these islands that represents these destructive insects.

To these may be added other caterpillars called 'top-borer,' the nature of which is sufficiently explanatory and you will know better than myself the chances of introducing these.

It is certain that two or three larvae of the pests that live in the stem of the cane might serve to populate these islands in a few years with countless numbers of their species. What effect the remedies you adopt in treating imported cane would have on the larvae hidden from sight in the heart of the stem I do not know, but I would suggest that you experiment with these remedies on island cane infested with the island borer in different stages of growth. I believe that a stick of cane containing a few small larvae of borers would show little or no external sign of being affected, yet these would be quite sufficient to stock the islands. Therefore all cane imported should be rigidly treated and in such a way as to make sure that borers or their larvae concealed in the heart would be destroyed, and at the same time the cane should be uninjured by the means adopted. The cane of these islands being at the present time free from so many highly injurious foreign borers it is of the utmost importance to keep them free.

The other most injurious pests of cane which would be likely to be introduced are species of that class to which the 'Japanese beetle' of these islands belongs. Such are the well-known Lepidoderma (Lepidiota) albo-hirta of Australia, the Apogonia destructor of Java, &c. Some of these species not only do great damage by devouring the roots of the cane as larvae, but like the 'Japanese beetle' defoliate the surrounding trees, as mature beetles. Insects of this class are much more likely to be introduced with other plants from infected districts than with cane itself.

No doubt the list of insects injurious on these islands could be increased by special observations, and more definite information about many of them would be desirable. My own work during the 10 years that I have worked at the Hawaiian fauna has been chiefly purely scientific, as opposed to economic, and has led me rather to the mountain forests with their comparatively abundant and highly peculiar fauna, so strongly opposed to the common-place foreign insects of the plains and cultivated regions, and excepting on this island and Kauai I have rarely visited a cane-field. Consequently I can give you no definite information as to the range of the various species I have enumerated on the different islands of the group. With regard to the Hawaiian cane-borer it is perhaps worth remarking that about 1877 it was only reported as rare in banana stems in the mountains and the Rev. T. Blackburn, at that time a resident naturalist, makes no mention of it as attacking cane. It was not till ten years later that specimens were sent to Washington as an insect injurious to cane. Al-

though certainly introduced, it is not likely that the time of its introduction will ever be known.

Yours very truly,

R. C. L. PERKINS.

In November of last year Prof. Koebele, as chairman of the Committee on Diseases of Cane, gave an impressive example of the risk which would be entailed by insufficient precautionary measures respecting variety importations. From his report we would quote as follows:

"Sometime during the spring of the present year, Mr. R. E. Blouin had written to Demerara for a select lot of seedling canes, to be cultivated on these islands. As shown in note received by Mr. Eckart, the Diamond Plantation shipped the same on July 5th, 1901. As we have been able to trace it, the consignment came by way of New Orleans and had been shipped to San Francisco by the S. F. & S. J. R. R. Co. It arrived at this port on the S. S. Mariposa, September 28th.

"On October 12th the Experiment Station was notified of the arrival of the same. Being late on Saturday it could not be brought out until Monday, October 14th. As agreed with Mr. Clarke, I examined the cane the following day.

"The consignment consisted of a single sugar barrel with some eight holes surrounding the same, about one by five inches. The cane within having been tied up in bundles, according to the varieties, were surrounded with dry leaves. Both of the ends were tarred. We could find but very few sticks that had any moisture left, evidently the same had been dead for several weeks. Many of them, and even the tarred ends, showed holes from where some insects had issued. Every stick was split open and carefully examined, and was found to be inhabited by hundreds of our common ant, Pheidole megacephala; a cosmopolitan species. Most of them showed the work of the cane borer, similar in all respects to the work of our own beetle, some even consisted of but a shell filled with loose fiber and many cocoons, open at the one end. We also found a few fresh traces of larvae of various stages, yet none of these could be detected, owing to the numerous ants that had devoured the same. Within one of the cocoons a pupa of the beetle was found partly devoured by the ants. At the bottom of the barrel a beetle was found which had been destroyed sometime previous by a fungoid disease. I found but two perfect cocoons, one containing a comparatively fresh insect, yet destroyed by this parasitic fungus some two or three weeks previous. The second contained a living beetle which was the only one in the whole consignment. The barrel and its contents were immediately burned."

From what has been said concerning the danger of introducing these various cane pests into the Islands we believe it is made evident that no precaution should be omitted which will assist in averting such injurious consequences. The en-

deavor to substitute hardier and thriftier canes for certain localities where climatic conditions and present varieties seem incompatible is but a natural desire, but such substitutions are apt to do more harm than good if we are at the same time to accommodate prolific breeding pests of a serious nature on our cane fields.

By a proper system of cane examination and fumigation together with the inspection of other plants entering these islands, this danger will be reduced to a minimum.

Senders of cane should be requested to exclude leaf-wrapping from their consignments and to prepare only perfectly sound sections for shipment. The simple sealing of the ends of seed canes with paraffine, and wrapping the individual pieces with paper before bagging will insure the best keeping conditions and the least danger of introducing destructive insects.

Respectfully submitted,

C. F. ECKART,
Director, Experiment Station.

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IMPROVEMENT IN CANE CULTURE IN QUEENSLAND.

A year or more ago, when Dr. Maxwell took charge of the Mackay station, the varieties of cane under growth were exclusively such as had been introduced from New Guinea, of which there were some seventy different kinds. The condition of those varieties was extremely unpromising, due in a large measure to the extreme drought. The cultivation, however, was changed, and certain special mixtures of manures were applied. Fortunately, good rains set in at the time, continuing in abundance through the growing season, the result being that an immediate growth began, which continued, and at a rate that the Director had never observed, even in countries such as Hawaii. Between January 1 and June a growth had been made which was simply astounding, the cane which at the end of December did not show one joint, and was actually dying out, having developed so as to yield a crop of a very notable character. In the month of August the whole of these seventy varieties of cane were cut, weighed, analyzed, and the weight of cane and the weight of sugar produced per acre by each variety determined. It is necessary, however, to repeat the experiments before making a full publication of the behavior of each variety, as it does not do to draw conclusions from single tests, especially if these are made on a small scale. Nevertheless, these determinations of the value of the different New Guinea varieties as sugar-producing canes indicate variations between very wide extremes. One variety gave less than twelve tons of cane per acre, while another gave between sixty and seventy tons per acre, under the same conditions of cultivation and manuring. With regard to the

sugar content of cane, and the production of sugar per acre, one variety produced only a trifle over one ton of sugar per acre, while another actually produced ten tons of sugar per acre, and fifteen varieties produced over six tons of sugar per acre each. It may be safely said that this experiment in good cultivation, and with manures adapted to the nature of the soil and to the crop, at the Mackay station during the past year, fully confirms the Director's statement made in his report to the Queensland Government two years ago concerning the possibility of sugar production upon the Queensland soils, if the most modern practices in cane cultivation and in the application of manures are followed.—Mackay Standard.

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THE END OF THE BOUNTIES IN SIGHT.

Contrary to expectation, the Brussels sugar conference has finally led to a definite result. A convention was agreed upon, the chief feature of which is that sugar bounties shall be abolished and countervailing duties introduced against all bounty-fed sugar.

There is, of course, a possibility that the agreement will not be ratified by the various governments concerned, but it is no more than a possibility. The probability is in favor of ratification. The sugar interests of Germany, Austria and France naturally will oppose ratification and will exert their powerful influence to prevent legislation intended to carry out the convention. It is not likely they will be successful, however. While the sugar interest is a powerful one, and is backed by strong agricultural influence, there is no doubt that the various governments have long been tired of the bounty system, which is a serious drain upon their exchequers and maintains abnormally high prices for sugar to the domestic consumer, while cheapening it to foreigners, besides being a constant source of irritation in their foreign relations. It is difficult to believe that the people at large will hasten to the rescue of a system which makes sugar a luxury to them, while it enables other nations to use it in plenty.

Like every change, the transition to the new condition of things will involve much suffering and perhaps individual ruin. Many small factories that have been able to exist by the artificial conditions created by the bounty system, are apt to succumb to the uncertainties attending the transition period. But on the whole, it is fair to believe the peoples that have been paying bounties will be gainers by the change in the long run. The sugar manufacturers will be obliged to develop their home markets and sell sugar cheaper. This will enhance consumption, and the European countries may end by becoming as large consumers of sugar as the English peoples are today. When that point shall be reached, the European sugar industry will be on a wholesome and stable basis.

The bounty system was justified as a temporary expedient to develop the beet sugar industry. As a settled policy it was a grave economic mistake, which European statesmen have long recognized. They will be glad of the opportunity to "let go."

This important change is due almost entirely to the determined attitude of the British government. Opposition to the bounties was begun by the United States, and to the late Mr. Dingley is due the credit of having discovered the remedy in the form of countervailing duties. But, to compel the abolition of the bounties it was necessary that the chief customer of continental beet sugar, viz., England, take a resolute stand against it. This was done at the Brussels convention. What brought about the favorable issue of the conference was the stand of the British representatives, who laid down the statement that unless the bounties and "kartells" were abolished, their government would introduce countervailing duties. This brought the continental governments to their senses and forced the change.

The action of the Brussels conference is of exceedingly great importance to the United States. It practically solves the problem of the preservation of the American sugar industry. With the removal of the artificial stimulus that induced the colossal over-production of sugar, to which is due the depression in the sugar market, the reason for aid to the Cubans vanishes. With the sugar market thrown back upon the laws of supply and demand the market will no longer be glutted with a surplus of a million and a half of tons of sugar, and prices will once more become normal. All that the United States government need do now for the Cubans, if anything at all, is to find a temporary expedient to tide over until the resolutions of the Brussels conference can be put into effect. This will probably be about a year or two. At the end of that time the sugar market will have regained its natural equilibrium, and the Cuban planter can make a handsome profit. The process will be hastened by the fact that European manufacturers have lowered the price to be paid for beets, which is having the effect of materially curtailing the beet area.

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THE SUGAR BOUNTIES.

Of what little sugar-refining business is left to this country Liverpool is now at the head. There are eight refineries of any importance in Britain; Liverpool has four, and London and Greenock have two each—a pathetic remnant of a great trade. One of the chief authorities in the sugar industry in Liverpool is Mr. Sigmund Stein, and with him a Pall Mall Gazette correspondent has had a brief interview as to the effect of the Agreement signed at Brussels.

"The immediate effect," said Mr. Stein, "will be disastrous. The bounties are not to be abolished till September, 1903. Now, what will happen in the meantime is that this country will be swamped with bounty-fed sugar. At present there is a surplus stock on the Continent, estimated at 1,200,000 tons. All this, and the sugar produced between now and September 1, 1903, will be thrown on to the English market. During the present year one can calculate that the foreign refiner will import into Great Britain 200,000 tons above the actual rate of consumption, and as much more as he can manage to manufacture. During the next few weeks you will certainly see the imports mount up to four or five times the average amount. The cheap money is in favor of the foreign importer, for he will have no difficulty about keeping the sugar in store on this side. We have heard a good deal about the beet-growers reducing their sowings, but we shall hear no more of it now till the bounties are abolished in fact, and not merely in principle. For the next crop, on the contrary, the sowing will be increased, and no one can blame beet-growers for it.

"In fixing so long a period," said Mr. Stein, "before the bounties are abolished, I think, looking at it from the point of view of the British refiner, a great mistake has been made. It practically means that neither for us nor for the West Indian will there be any trade whatever for eighteen months, and I should not be surprised if for eight or nine of these months the English refiner will have to close his factories. The loss that means you can easily realize.

FUTURE PROSPERITY PREDICTED.—"But when the storm is over," Mr. Stein went on, "I look for a period of prosperity for the British refiner and the West Indian. Factories will soon begin to open again; in fact, I have heard of preparations in that direction already. Britain is the greatest sugar consumer in the world, and I believe it will become the greatest sugar producer. Then I look to see a new field opened for the agriculturist in the way of beet growing. In the past the farmer has had no encouragement to grow beet, for it could not by any means pay him. The experiments I have made over a considerable period now show that beet can be grown with success in this country. There is plenty of room for the West Indian planter and the beet-grower at home, for the consumption is always on the increase. Altogether, when the present interregnum has passed, I hope to see a return of great prosperity to the British refiner."—Pall Mall Gazette.

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EFFECT OF WATER SUPPLY ON SUGAR CANE AND SUGAR.

Dr. L. Kamerling publishes the following report in the International Sugar Journal on his researches at the West Java

Sugar Experiment Station, dealing with the results of his investigations on the rapid deterioration in quality of some cane sugars:

Some authors have attributed the rapid deterioration of the quality of cane sugar by inversion chiefly to its amount of moisture, others, however, are of opinion that this deterioration is caused by acids or by micro-organisms.

That moisture alone should have such a deleterious influence was inadmissible, as it has been sufficiently proved that sterilized sugar solutions may be preserved for years without deterioration.

If diluted solutions remain unaltered, provided they do not contain micro-organisms, how much greater are the chances of preservation when sugar is only slightly damp?

The amount of acids also need not be the only reason, as I happened to analyze a parcel of white refined sugar from Hongkong, packed in mat-bags and lying in a damp godown, which in four months had lost 5 per cent in polarization. The percentage of moisture amounted to 2.25 per cent and the glucose, originally so insignificant as to prevent its proper determination, now reached 2.35 per cent. Yet the sugar had a neutral reaction, therefore, neither acid nor ashes, nor products of decomposition of glucose could have caused the inversion.

In order to investigate experimentally whether water alone, or water with the aid of acids or micro-organism promotes the rapid deterioration, a certain quantity of refined sugar was divided into two parts.

One part was sterilized as much as possible by exposing the sugar to a temperature of 100°, the other being left as it was. Of both a portion was left intact, another portion moistened with 1 per cent water, a second with 2 per cent water and a third with 2 per cent of a 10 per cent soda solution.

Five sterilized glass tubes were filled with a part of these portions and with the remainder, tubes into which a piece of matting was introduced.

Every month one tube of each of these portions was opened, and the contents analyzed, from which analysis it resulted that dry sugar, even when containing germs, can be preserved, but that non-sterilized moist sugar very soon becomes inverted, but does not turn acid at the outset.

Sugar in which micro-organisms are, as far as possible, killed by exposing it to a temperature of 100°, hence not completely sterilized, also deteriorates, but much less than sugar in which more germs are present.

Alkalinity of the moist sugar is in no way a complete protection against inversion.

As long as the reaction is strongly alkaline (0.2 per cent

soda) the inversion goes on slowly, but as soon as the alkaline reaction is neutralized either by acids secreted by fungi or resulting from the glucose formed by inversion, there is no difference whatever between alkaline and neutral sugar.

Notwithstanding this experiment not being decisive, because I did not succeed completely depriving the sugar of germs, the result indicates that the inversion is caused by the activity of micro-organisms, rendered possible by the presence of moisture.

A direct proof that neither the glucose nor the ashes, nor water are the immediate cause of the deterioration, was obtained by distributing a quantity of refining crystals, taken immediately on leaving the sugar-drier or garnulator, in a series of sterilized glass culture dishes.

A part was moistened with sterilized water; into some dishes a piece of matting was introduced; in others a piece of matting, first soaked in a 1 per cent solution of carbolic acid or in a solution of formaline, the rest being left without any addition.

Over the sugar crystals in other dishes was poured so much diluted solution of certain disinfectants as to make the total amount of moisture the same as in the case where sterilized water was added. In one-half of the dishes thus prepared pieces of matting were put, whilst the other half were left as they were. The dishes were placed in a room protected from dust or micro-organisms and were analyzed every month.

The moist sugar without any addition remained unaltered, proving that sugar when leaving the sugar-drier is practically sterile, and next that neither glucose nor ashes nor water are the primary causes of the deterioration.

The moist sugar with the non-disinfected piece of matting immediately deteriorated considerably; that in which the matting was disinfected in strong solutions was well preserved, but the sugar with its piece of matting placed in very dilute disinfecting liquids also deteriorated.

Sugar mixed with disinfectants remained as it was even when a piece of matting had been introduced into the dish, unless the concentration of the disinfectants had been too weak to kill the micro-organisms, in which case they inverted the sugar just as if no disinfectant had been used.

It results from the foregoing that micro-organisms are the primary cause of deterioration, and in fact a complete flora of fungi can be met with on the matting.

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BRUSSELS SUGAR CONVENTION.

U. S. Minister Townsend transmits from Brussels the following translation of the sugar convention signed March 5:

I.—CONVENTION CONCERNING THE SUGAR REGIME.—His Majesty the Emperor of Germany, King of Prussia, in the

name of the German Empire; His Majesty the Emperor of Austria, King of Bohemia, etc., and Apostolic King of Hungary; His Majesty the King of the Belgians; His Majesty the King of Spain and, in his name, Her Majesty the Queen Regent of the Kingdom; the President of the French Republic; His Majesty the King of the United Kingdom of Great Britain and Ireland and the British Possesions beyond the Seas, Emperor of India; His Majesty the King of Italy; Her Majesty the Queen of the Netherlands; His Majesty the King of Sweden and Norway—

Desiring, on one hand, to equalize the conditions of competition between beet and cane sugars from different sources and, on the other hand, to promote the development of the consumption of sugar;

Considering that this double result can only be attained by the suppression of bounties as well as by limiting the surtax;

Have resolved to conclude a convention to this end, and have nominated their plenipotentiaries as follows, to wit:

His Majesty the Emperor of Germany, King of Prussia, in the name of the German Empire:

Count de Wilwitz, his Envoy Extraordinary and Minister Plenipotentiary to His Majesty the King of the Belgians, etc.

ARTICLE 1.—The high contracting parties bind themselves, from the date the present convention comes into force, to suppress the direct and indirect bounties by which the production or export of sugar may benefit, and they agree not to establish bounties of this kind during the whole duration of the said convention. In view of the execution of this provision, sweetmeats, chocolates, biscuits, condensed milk, and all other analogous products, which contain in a notable proportion sugar artificially incorporated, are to be classed as sugar.

The above paragraph applies to all advantages resulting directly or indirectly, for the different categories of producers, from the fiscal legislation of the States, notably:

(a) The direct bounties granted to exports.

(b) The direct bounties granted to production.

(c) The total or partial exemptions from taxation granted for a part of the manufactured output.

(d) The profits derived from surplusages of output.

(e) The profits derived from the exaggeration of the drawback.

(f) The advantages derived from any surtax in excess of the rate fixed by article 3.

ARTICLE 2.—The high contracting parties bind themselves to submit to bond regime the sugar factories and refineries, as well as those factories in which sugar is extracted from the molasses, in order that they shall be under the permanent surveillance, day and night, of the customs employees.

With this object, factories will be arranged in such a way as to prevent the taking away of sugar clandestinely, and the customs employees will have the right to enter every department of the factories.

Books of control in regard to any or several phases of production will be kept, and the manufactured sugars will be deposited in such special buildings as will afford every desirable guaranty of security.

ARTICLE 3.—The high contracting parties bind themselves to limit the surtax to a maximum of 6 francs per 100 kilograms ($1.15 per 220 pounds) for the refined sugar and the sugars assimilable thereto, and 5.50 francs ($1.06) for other sugars—that is to say, the difference between the rate of duty or taxation to which foreign sugars are subjected and that imposed on the home product.

This provision is not to be applied to the rates of import duties in the case of countries that do not produce sugar; nor to the by-products of the manufacturing or refining of sugar.

ARTICLE 4.—The high contracting parties bind themselves to impose a special duty on imports into their respective territories of sugars from countries that grant bounties for production or exports.

This duty shall not be less than the amount of the bounties, direct or indirect, granted in the country of origin. The high parties reserve to themselves the privilege, each as it may affect its own interests, to prohibit the importation of bounty-fed sugars.

For the estimation of the sum of advantages derived eventually from the surtax specified under section *f* of article 1, the rate fixed by article 3 is deducted from the amount of this surtax; half of the difference is held to represent the bounty, the permanent commission organized under article 7 being entitled, at the request of one of the contracting States, to alter the rate so provided for.

ARTICLE 5.—The high contracting parties bind themselves reciprocally to admit at the lowest of their respective import rates sugars imported from any of the contracting States or from any colonies or possessions of said States that do not grant bounties and to which the obligations imposed in article 8 apply.

Cane and beet sugars can not be subjected to different rates of duty.

ARTICLE 6.—Spain, Italy, and Sweden are not held to the obligation imposed in articles 1, 2, and 3 so long as they do not export sugar.

These States bind themselves to adapt their sugar legislation to the provisions of the convention—within one year, or earlier if possible—from the time that the permanent commission has verified that the above condition has ceased to exist.

ARTICLE 7.—The high contracting parties agree to create a permanent commission, having charge of the surveillance of the execution of the provisions of the present convention.

This commission shall be composed of delegates of the different contracting States, and to it will be attached a permanent bureau. The commission elects its president; it will sit at Brussels, and shall meet on the call of the president.

The duties of the delegates will be:

(a) To verify whether, in the contracting States, any direct or indirect bounty for the production or export of sugars is granted.

(b) To verify whether the States named in article 6 continue to conform themselves to the provisions of this article.

(c) To verify the existence of bounties in the nonsignatory states, and to estimate the amount of such bounties with a view to applying the provisions of article 4.

(d) To issue an advice on litigious questions.

(e) To examine the requests for admission to the union from states which have not participated in the present convention.

To the permanent bureau is intrusted the compilation, translation, coordination, and publication of information of all kinds relating to the legislation and statistics of sugars, not only in the contracting States, but also in other states.

To secure the execution of the above provisions, the high contracting parties shall communicate, through the diplomatic channel, to the Belgian Government, which will transmit them to the commission, copies of the laws, decrees, and regulations relating to the taxation on sugars that are or may be in operation in their respective countries, as well as statistical information relating to the object of the present convention.

Each of the high parties is entitled to be represented on the commission by a delegate or by a delegate and associate delegates.

Austria and Hungary shall be considered separately as contracting parties.

The first meeting of the commission shall take place at Brussels, on the call of the Belgian Government, at least three months before the present convention comes into force.

The duties of the commission shall be confined to verification and examination. It will make a report to the Belgian Government on all questions submitted to it. Said report will be communicated to the interested states by the Belgian Government, and the latter shall, if requested so to do by any of the high contracting parties, promote a meeting of a conference which shall decide on the resolutions or the measures necessary under the circumstances.

The verifications and estimations, however, under sections *b* and *c*, shall have a binding character for the contracting

States; they shall be established by a vote of the majority, each contracting State disposing of one vote, and they shall come into effect, at the farthest, at the expiration of a period of two months.

In case one of the contracting States were to appeal from the decision of the commission, it shall have to promote, within eight days after the notification of the said decision, a new deliberation of the commission; the latter shall meet under urgent call and shall decide definitely within a period of one month from the date of appeal.

The new decision shall be executory, at the latest two months after its date. The same proceedings to be followed in regard to the examinations of requests for admission under the provisions of section *c*.

The expenses arising from the organization of the permanent commission—except the salary and the compensations of the delegates, which are to be paid by their respective countries—shall be borne by all the contracting states and shall be assessed among them according to a method to be decided upon by the commission.

ARTICLE 8.—The high contracting parties bind themselves on their behalf and on behalf of their colonies and possessions, exception being made in the case of the autonomous colonies of Great Britain and British East Indies, to resort to the measures necessary to prevent bounty-fed sugar which has passed through the territory of a contracting State from having the same advantages as those accruing under the convention on the market they are destined for. The permanent commission shall present in this connection the necessary propositions.

ARTICLE 9.—The States that have not taken part in the present convention shall be admitted to adhere thereto upon request and after a favorable report of the permanent commission.

The request shall be addressed through the diplomatic channels to the Belgian Government, which will take charge eventually of notifying the adhesion to all the other Governments. The adhesion shall involve, in full right, the accession to all charges and the admission to all advantages enumerated in the present convention, and it shall enter into force from the 1st of September following the transmission of the notification by the Belgian Government to the other contracting States.

ARTICLE 10.—The present convention shall come into force from September 1, 1903.

It shall remain in force during five years from this date, and if none of the high contracting parties shall have notified the Belgian Government twelve months after the expiration of the said period of five years of its intention to have its effects

ceased it shall continue for one year, and so on from year to year.

In case one of the contracting States were to denounce the convention, this denunciation shall take effect only as it may affect its own interests; the other States would retain, until the 31st of October of the year of the denunciation, the privilege of notifying their intention to also retire on September 1 of the following year. If one of the latter intended to make use of this privilege, the Belgian Government is to promote a meeting at Brussels, within three months, of a conference which would have to determine the measures to be resorted to.

ARTICLE 11.—The provision of the present convention shall apply to the provinces beyond the seas, colonies, and foreign possessions of the high contracting parties. The colonies and possessions of Great Britain and the Netherlands, however, are not to be included in this regulation, except as far as it is provided in articles 5 and 8.

The status of the colonies and possessions of Great Britain and the Netherlands is, moreover, defined by the declarations inserted in the final protocol.

ARTICLE 12.—The execution of the reciprocal engagements contained in the present convention is subjected, inasmuch as need be, to the performance of the formalities and rules established by the constitutional laws of each of the contracting States.

The present convention shall be ratified and ratifications thereof shall be deposited at Brussels, at the Ministry of Foreign Affairs, on February 1, 1903, or earlier, if possible.

It is understood that the present convention shall only become binding after it has been ratified at least by the contracting States that have not been affected by the exceptional provision of article 6. In case one or several of the said States have not deposited their ratifications within the time provided for, the Belgian Government shall immediately endeavor to obtain a decision from the other signatory States as to the entering into force of the present convention among themselves.

In faith of which the respective plenipotentiaries have signed the present convention.

Done at Brussels, in one single copy, the 5th day of March, 1902.

II.—FINAL PROTOCOL.—At the moment of proceeding to the signature of the convention relating to the regime of sugars, entered into on this date by the Governments of Germany, Austria and Hungary, Belgium, Spain, France, Great Britain, Italy, the Netherlands, and Sweden, the plenipotentiaries have agreed to the following:

To ARTICLE 3.—Considering that the purpose of a surtax is to protect efficaciously the internal market of producing countries, the high contracting parties reserve the right, each as it

affects its own interests, to propose the increase of the surtax in case that considerable quantities of sugars from one of the contracting States should enter their countries; this increase to affect only the sugars coming from that State.

This proposition shall be addressed to the permanent commission, which will decide within a short delay, by a vote of the majority, upon the true foundation of the proposed measure, upon the duration of its application, and upon the rate of the increased tax; the latter not to exceed 1 franc per 100 kilograms (19 cents per 220 pounds).

The adhesion of the commission can only be given in case the invasion of the market in question should be the result of an economical condition of real inferiority, and not the result of a factitious increase of prices promoted by an understanding among producers.

To ARTICLE 11.—A.—(1) The Government of Great Britain declares that no direct or indirect bounty shall be granted to sugars from colonies of the Crown during the existence of the convention.

(2) It declares also, by exceptional measure and while still reserving, in principle, its entire free action concerning the fiscal relations between the United Kingdom and its colonies and possessions, that during the existence of the convention no preference shall be granted in the United Kingdom to colonial sugars vis-a-vis the sugars coming from the contracting States.

(3) It declares that they will submit the convention to the autonomous colonies and to the East Indies in order that the latter may have the privilege of giving their adhesion thereto.

It is understood that the Government of His Brittanic Majesty shall have the right to adhere to the convention in the name of the Crown colonies.

B.—The Government of the Netherlands declares that during the existence of the convention no bounty, either direct or indirect, shall be granted to sugars of the Dutch colonies, and that these sugars shall not be admitted into the Netherlands at a less rate than is applied to sugars coming from the contracting States.

The present final protocol, which shall be ratified at the same time as the convention concluded this date, shall be considered as an integral part of said convention and shall be of the same force, value, and duration.

In faith of which the plenipotentiaries have drafted the present protocol.

Done at Brussels, the 5th day of March, 1902.

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THE SUGAR INDUSTRY IN QUEENSLAND.

The position of the sugar industry in this State undoubtedly causes thoughtful men no little anxiety, the more so because

there seems little chance of securing reasonable aid from any source but our own personal, and individual efforts as manufacturers and producers of sugar. Politics have intervened to seriously compromise the success of the industry, but politics have in no way intervened to show that we may look for any assistance to tide us over our difficulties. Already it is becoming only too obvious that the most extravagant wages will not produce the men to take off the cane crops, for the simple reason that there are not sufficient unemployed in the country. At the same time we have been told very plainly that we may ask in vain for the Government to take in hand the encouragement of the immigration of the poorly paid laborers of Europe, to take the place of the men, who in a year or two, will have been sent back to their islands. As we have said before, and we cannot fail to repeat the statement in the face of the optimism amongst the less thoughful of the sugar growers, there is bound to be a scarcity of labor shortly. If the high wages attract the men into the fields, then the factories will go short of men, and the trouble will be there, instead of in the fields. For our own part we are inclined to think there is likely to be grave trouble all round, and it rests with those engaged in the sugar industry to seriously strive to face the music, and provide in some degree at least for the future. There are certain compulsory reforms, if the industry is to live. It is useless just now to talk about a sugar refinery as being the royal road to the settlement of all our difficulties. Many of the central mills even now are not in a position to sell their sugars just where they please, and in any case a period of bitter contest between the present and proposed refineries, with a consequent low range of prices, and diminished payments for cane, is hardly the best method by which to pay high rates of wages to white laborers or to tide the farmers over the bad times, from which so many of them are suffering. A cooperative refinery may be the ultimate rule of the co-operative sugar system, but at the present time the central mill companies are too weak, and their accumulated capital, with which they would have to fight the other refiners is so small, that we may look upon the refinery as an impossibility, or a folly. The co-operative factories came into being because the farmers were growing too much cane for the existing mills, and the refinery will doubtless come into existence, when, and not before, the present refineries are unable to deal with the present sugar consumption of Australia. What then are the reforms open to the producers of raw sugars. Farming in the first place has to be put on a very much sounder basis. Irrigation, fertilization, and systematic cultivation upon the most approved methods is essential to progress. It has been argued that the farmers have no money for these things, but as the refineries are now handing over to the growers, through the mills, practically the whole of the

profits arising from the operation of the Federal tariff, there should no longer be so little money available for this purpose. With the bonus given by the Commonwealth the farmer should get over £1 a ton for his cane, and if he can find a cheap way of harvesting his crop he could make sure of receiving practically the whole of this amount. In any case it is well to make it perfectly clear to the producers of cane, that they have only two roads open to them—the one to adopt the most economical system of cultivation, and the other to go out of cane-growing altogether, and try something else. There is no doubt a considerable section of the cane-growers who are willing to listen to Dr. Maxwell's advice, but there is marvellously little keen anxiety about obtaining and acting upon it. —Queenslander.

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EXTERMINATION OF WEEDS.

A great difficulty in the extermination of weeds is the fact that the seeds of many species will lie in the soil for several years without losing their vitality, and when turned up to the surface will germinate and produce a new crop of weeds in ground which is considered to be clean. It is for this reason that several years of diligent culture is necessary before a field can be cleaned of such weeds as come to maturity after the harvesting of crops, and it is for this reason that summer fallow, unless the idle area be periodically scarified, will result in seeding the field more than before. One cannot keep before his mind too prominently the fact that until all seeds lying in the ground can be caused to germinate, and the young plants destroyed, an area cannot be cleared of weeds. Such, in effect, is the opinion of Mr. J. W. Blankinship, State Botanist of Montana. That State, by the way, is, in the agricultural sense, a new one, and is in some respects like some parts of New South Wales, inasmuch as there are annually coming into cultivation great tracts of new land, free, or nearly so, of most of the weeds that infest worn lands, and in positions so isolated and so far removed from the risk of natural infestation that the exercise of due precautions on the part of the settlers can keep the noxious vegetation at bay. The great thing in our warfare against weeds is never to let them become established. Even with the most effective of scarifying implements, an odd weed or two in corners inaccessible to the machine may escape destruction and serve to frustrate the farmer's best efforts. In Montana they have had a weed law in force, since 1895, and the results are good; but the evils of weed-infestation are so great, and the amounts of solid cash they divert from the cultivator's pocket are so considerable, that anything in the shape of coercion seems rather ridiculous. A thorough scarifying every three weeks in spring and early summer, autumn plowing, and an occasional clean up of odd

corners with a hoe for small areas, and a flock of sheep on the stubble and summer fallows for large areas, are means by which weeds can be most speedily and effectually conquered. The great trouble that a man out on the warpath against weeds has to encounter is the possible apathy or worse of a neighbor. Try and convert him. Keep your own land as clean as possible; and if every other means of inducing your neighbor to do his share of weed extermination fails, keep on showing him the cheques that come in return for the crops off your clean land.—N. S. W. Ag. Gazette.

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SECRETARY WILSON'S REPORT.

The fruit interests of this country have grown to enormous proportions, and the pomological work of the Department is designed to promote them in every way possible. With this end in view, a large exhibit was last year maintained at the Paris Exposition, the object being chiefly to encourage a demand for American products. The beneficial effects of this work are already showing in the increased demand for American fruits, especially oranges and apples. In 1899 the United States exported 380,222 barrers of apples, valued at $1,210,459. In 1900, 526,636 barrels were exported, valued at $1,446,555. Already in 1901, 855,673 barrels have been exported, valued at $2,038,964. The value of the oranges exported in 1901 is double that of 1900, all of which can largely be traced to the interest aroused by the work at Paris."

There are many other topics, only a few of which can be referred to here. A paragraph on "Encouraging the Prune Industry of the Pacific Coast" says: "The prune industry of the western states has grown to large proportions, but in order to compete with foreign trade the need has long been felt for a better knowledge of methods of growing and handling the crop and the best varieties to plant. By an arrangement betweeen the pomologist and the botanist, an agent was sent during the year to France to study the prune industry there. The work of this agent resulted in the discovery and introduction of several important varieties that promise to be of value in the Pacific Northwest."

"Growing European Grapes in the South," is another subject. "The United States imports every year large quantities of European grapes, which are sold mostly for table use. It was believed that some of these varieties could be grown in the south, and to test the matter a number of plantings were made there three years ago. These grapes fruited one year ago, and the indications are that some of the varieties will be found valuable for our markets.

On "Diseases of Orchard Fruits," the report says: "The peach in this country has generally been a very profitable crop, but for many years it has been subject to a number of

serious diseases. Some of these can now be controlled, notably "yellows" and peach leaf curl, two of the worst enemies of peach growers. A few years ago a new disease appeared in some of the finest peach orchards of New York, Michigan, and other states, and this trouble has caused growers a great deal of uneasiness. The Department has had one of its most competent experts engaged on the disease, and he believes that he has discovered the cause. The disease in question is known as "little peach," from the fact that the fruit ripens when very small, this symptom becoming more pronounced each year until the tree dies, which it invariably does at the end of two or three years. The cause of "little peach" is believed to be a fungus which attacks the very young roots, and already the matter of preventing it by securing resistant stocks has been taken up.

"Ever since the appearance of the San Jose scale in the United States the question of its original home has been a mooted one; and, since none of the parasitic and predatory insects of this country seem to be very efficient in destroying this scale, it has become an important point to decide, if possible, the question of the original home of the destructive insect, since it is quite fair to suppose that if efficient parasites are to be found they will be found in the original home of the scale. The importance of this question can hardly be overestimated, since the damage which the San Jose scale has done to the fruit-growing insects of the country, especially of the eastern states, is almost beyond estimate.

"The evidence accumulating during the past two or three years had seemed to show that very possibly this scale was imported into this country from Japan, and in the spring of the present year the assistant entomologist, Mr. Marlatt, was sent to Japan, for the purpose of studying the question on the ground. Unexpectedly to most entomologists, although not to the entomological force of the Department of Agriculture, it was quite definitely ascertained that the San Jose scale is not indigenous to Japan, but that, quite to the contrary it was introduced into that country from the United States upon fruit stock at several different times and at several different points. The most careful search failed to reveal the scale in portions of Japan where American plants had not been introduced. Mr. Marlatt's travels in the Japanese Empire lasted about five months, and having satisfied himself, as just stated, he proceeded to China, visiting Chefoo, the port of the great foreign fruit district of North China, where the industry was started by a missionary (Dr. Nevins) some thirty years ago, since which time it has extended over the province. Foreign fruits were introduced and are now grown alongside the native fruits or grafted on native trunks. The San Jose scale was found there, but the admixture of foreign trees with the native trees prevented any conclusion as to whether the scale

was indigenous or not. Proceeding to Pekin, he found the fruit markets enormously stocked, and representing exclusively the product of the surrounding country and the districts south of and adjacent to the Great Wall. All the fruits were native. The apples were small and the pears were hard and woody. Nearly all this fruit was infested by the San Jose scale.

"At Tientsin the same conditions were found in the fruit markets, and in the city gardens and private yards the San Jose scale was found on a flowering shrub, coming from North China. In all the regions between Tientsin and Pekin and the Chinese wall native fruits only are grown, and no foreign stock of any kind has ever been introduced. Apples, pears, peaches, apricots and plums are extensively grown on the sunny slopes of all the hills south of the Great Wall. The San Jose scale in this district could not have come from any foreign country, as there have been no importations, and the fruits are all of native sorts. The scale occurs very scatteringly, although generally, just as it should if native, and is in a state of balance with its native natural enemies. It has a natural enemy, everywhere present and efficient in a ladybird beetle known as Shilocorus similis. From this evidence Mr. Marlatt concludes without doubt that the San Jose scale is a native of North China. He has collected many specimens of this efficient natural enemy, and has forwarded them to Washington. Steps will be taken to establish and acclimatize this important species, and it is hoped that it will prove as efficient against the San Jose scale in this country as it has in its native home. It is not beyond the bounds of probability that this importation will prove to be one of extreme value to the fruit growers of the United States.

Possibly the next most important of these beneficial insects which have been produced is a caterpillar enemy of the black scale, which has been brought over in a healthy living condition from Italy, by the assistance of Prof. Antonio Berlese, of the Royal School of Agriculture at Portici. The black scale is a serious enemy to olive culture in California. It occurs not only upon the olive, but also less abundantly upon citrus trees, upon a shade tree known as the pepper tree, and other plants. It is the greatest drawback to olive culture in this country. The caterpillar in question, Erastria scitula, is found in Mediterranean regions, and is probably one of the principal causes of the comparative freedom of olive trees from black scale in that part of the world. The Division of Entomology has for eight years been attempting to bring this insect to the United States in living condition, and success for the first time was reached in Nov., 1901. This beneficial insect will be established in California with the assistance of the State Board of Horticulture of that state. It should be

stated that the black scale is apparently a native of the general region from which this beneficial insect has been sent.

"Another importation which may also prove to be an important one is a ladybird beetle, which as Coccinella septempunctata, which has been brought over from Hungary with the assistance of Prof. Chas. Sajo. This insect, native of Europe, feeds upon several destructive plant lice which have been accidentally imported into this country from Europe, and upon the larvae of the destructive asparagus beetles.—Flor. Ag.

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THE STANDARD SAND FILTER.

Walter Tiemann, in Int. Su. Journal.

The recent excellent results obtained with the Standard Sand Filter in Hawaii, one of the most advanced raw sugar-producing countries, gives one some excuse for drawing attention to the usefulness and efficiency of this filter. The first one introduced into that country proved so successful that during the last year over sixty more have been erected.

There can be no doubt that the filtering qualities of sand are not surpassed by any other material as regards cheapness, ease of manipulation, and regeneration. This is a fact well known and made use of not only for sugar solutions, but also to a far larger extent for water filtration, milk filtration, &c., where, imitating nature, an extensive filtering surface is established, as in the case of large waterworks, giving the best results as to clearness, and also from a bacteriologico-hygienic point of view. Of course for clarifying water or sugar solutions in factories the largest possible filtering surface ought, for practical reasons, to be given in the most compact form, and the facilities for filling, emptying, and cleaning, are weighty details to be taken into consideration.

The new Standard Sand Filter has the merit of combining the largest possible filtering surface with the smallest requirements of space. The advantages claimed for it of absolute cleanliness and facility in handling are evident, and the sparkling brightness of the filtered solution is not surpassed by any other system, not even charcoal.

The effect is extraordinary, even with the most cloudy solution, as is confirmed by personal testimony. The Oahu Sugar Company recently wrote through Mr. Aug. Ahrens, their managing director, to Mr. George Stade, Berlin:—"The Standard Sand Filter plant you forwarded in October for our sugar-works, dealing with 1500 tons of canes per day, has been worked for the whole crop now. The success of this new arrangement is such that it causes general astonishment, and I am extremely satisfied with the work done. The heating surfaces of the different pans remain very clean; but what I

consider to be of more importance is that we receive now a brilliant and entirely clean juice and better molasses for reboiling, and consequently a considerable higher yield in all sugars. I have not the slightest doubt that a good many of our sugar-works will go in for your Standard Sand Filter after having convinced themselves of the good work done in our mill. Other filters have been repeatedly tried here, but have entirely failed to give satisfaction. I have already had plenty of visitors inspecting your plant, and it is commonly declared to be of highest practical value."

The filters run 4-8 days, and up to the last hour the juice remains very fine. The washing out of the filter takes about 30 minutes, and there is no sugar left in the discharged sand. Loss in sugar, such as occurs with filter-cloths, is entirely excluded. The discharging and refilling with the same regenerated sand is very simple. After washing the sand for a few minutes with running water or by means of an injector, the whole of the scum quickly separates, and the sand is ready for again using in the wet state.

The Standard Sand Filter is in general use for thin and concentrated juice, all kinds of syrups, and refinery liquors.

By means of a thorough purifying of the juices, and the consequent complete disparition of all deposits caused by defecation and saturation, as well as of all substances in solution, the factories are of course able to turn out a much better quality of sugar. If the thin syrup is well filtered, the concentrated syrup is much easier to deal with, being free from foreign substances. In many factories a filtration of the concentrated juice is a great necessity, but it does not take place, for the simple reason that up to the present no suitable and sufficiently practical filter has been found for this purpose. Deposits form subsequently in the thick juice, especially through the use of sulphurous acid, so that the syrup is often of a very muddy appearance. If the filter above described be installed for this purpose, a product of perfect quality is obtained, and also much better by-products. A greatly improved vaporisation and crystallisation of the clear syrups thus obtained is also very noticeable. Besides the splendid mechanical filtration, an undoubted chemical action is set up in regard to the alkaline deposits, which influence the crystallisation, and this action has been scientifically demonstrated.

All these advantages, the great simplicity and the entire doing away with any filter-cloth, the facility of manipulation and the quickness with which the sand is regenerated, combined with the limited requirements as to space, and the absolute guarantee for obtaining a splendid mechanical filtration, indicate that the Standard Sand Filters are likely to be appreciated by all sugar manufacturers.

THE PROSPECT IN SUGAR.

Whatever measure of accuracy may attach to the details of the recently published story of the German sugar "kartell," embracing producers and refiners, the general features of the narration are authentic and familiar. The story is that producers and refiners have a secret agreement in accordance with which the refiners pay a high price, more than the general market would justify, for raw sugar, and the producers assist the refiners in maintaining an export bounty system, under which sugar is sold abroad for whatever can be got for it, and is held at a high price at home, where it is selling for three times as much as the same German sugar is selling for in London. The maintenance of the domestic price affords enormous profits which the refiners share with the producers.

But no effective means have been devised for preventing the growth of a business that is exceptionally profitable, and as the business grows the exceptional profits cannot be maintained. This year's European sugar production is estimated by the "Centralblatt for Zucher-industries" at more than 25 per cent above that of three years ago. In this estimate the increase in Germany is taken to be nearly 15 per cent in three years. The capacity of the German market to absorb sugar at a high price is very greatly impaired by the depression of trade and the large number of persons out of employment, and the reduction of one-half or two-thirds in the dividends of stock companies. At the same time it is perfectly evident that the United States cannot long serve as a good market for German sugar; our own beet interests are growing fast, and a great increase in the production of cane sugar is certain in our newly acquired islands and Cuba, and it is evident enough that our own beet and cane interests are reaching the stage of a very serious, even if not a vital, struggle, wholly apart from the general question of the rivalry of beet and cane in the world's markets.

Cane production in Porto Rico and Hawaii is increasing fast. Willett & Gray estimate for the current crop 700,000 long tons of cane sugar produced within the territories of the United States, and an increase over the past year of 245,000 tons in Cuba, which is fast getting back to its high-water mark. A small increase is estimated in Java. The combined cane and beet estimate for 1901-2 is put at nearly 8 per cent above that of 1900-1.

Java correspondence of the Louisiana Planter describes the very extensive operations now going on in the way of improving varieties of cane in order to get more sugar from an acre. As a result of this one estate made over five tons of sugar per acre, and Queensland and several of the British West Indies are making every effort to improve cane and get more sugar. One company in Hawaii will get an average of

five tons of sugar per acre for its whole tract of 4,600 acres. Hawaiian sugar has generally gone to San Francisco, but the Hawaiian-American Steamship Company is said to have contracts to bring 80,000 tons of sugar to this port, and it is predicted that in two years the whole production of the Maui plantations will be marketed in the Eastern States.

Hardly any branch of agriculture is so profitable as sugar beet raising where the soil is favorable and a factory is at hand. The manufacture of sugar at present prices is abnormally profitable where it can be carried on on a sufficiently large scale. But most of the cane-producing countries can produce little else. They must stay in the business, and by improving their methods they can greatly reduce the cost of production. The world is bound to have cheap sugar, and the profits of culture and manufacturing will have to come down to normal rates.

In the meanwhile Germany is practicing an utterly vicious system, that of maintaining a very high domestic price and of exporting at a loss when it is necessary to do this. The consumer is taxed in the price and the whole nation is taxed to pay the bounty, and the refiner and the beet raiser are for the time being dividing large profits. It is only too evident that this cannot go on. Efforts are being made to reduce their acreage, but how can any grower be sure that other growers will not increase their acreage and profit by his self-denial? Germany would like to abolish the bounty system, but it is doubtful if Russia will agree to give it up. Germany has created a burden which she cannot long continue to carry and which she knows not how to lay down.—N. Y. Journal Commerce.

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A NEW INDUSTRY.

Within the last few days important experiments have been carried out in the colony which will result, it is anticipated, in the institution of a new and profitable industry in connection with the sugar estates. This is nothing less than the manufacture of a new cattle food, to which the name "Molascuit" has been applied. The idea originated with Mr. George Hughes, a director of the well known firm of Messrs. Edward Packard and Company, Limited, London, who himself is known all over the West Indies, having visited them no fewer than twenty-seven times. Mr. H. is at present in the colony on business. Before leaving London he applied for a patent for "Molascuit" which application has been accepted. In a conversation with a representative of "The Argosy," Mr. H. explained that "Molascuit" is a composition of molasses and cush cush of megass—the finest part of the fibre of sugar cane. Fifty per cent. of cush cush is digestible and nutritive. The proportions of the composition are 80 or 85 per cent. of

molasses, and 15 or 20 per cent. of cush cush. This composition is air-dried and may be so done by utilizing the gases from the factory furnace. When ready for the market it presents the appearance of very finely ground oil-cake, and to the taste it is sweet and agreeable. There is another preparation in the market, said Mr. Hughes, known as "Molassine meal" —made from beetroot molasses and a vegetable matter— which realizes £6 15s per ton and has a very good sale. But it is not nearly equal in value to, or so nutritious as "Molascuit," and he feels confident that before very long "Molascuit" will be generally adopted as a feeding stuff for cattle. Farmers and stock-breeders have a preference for molasses for feeding purposes, and would largely use it were it procurable in less cumbersome packages than hogsheads or barrels, from which there is also a considerable loss through fermentation. "Molascuit" is just the preparation they want; it can be shipped in bags and is easily portable. A sample has been submitted to Professor Harrison, the Government Analyst, who has expressed himself approvingly of the article.

As a by-product of sugar Mr. H. considers that the manufacture of "Molascuit" should be of considerable advantage to planters who will thus have two strings to their bow in the disposing of molasses—in the manufacture of rum and "Molascuit"; and when the rum market is over-stocked the benefit of this will be apparent. He feels confident that within a very short time a very large demand will be created for "Molascuit." He has brought the matter before the Board of Agriculture with a view of getting the preparation officially recognized, so that uniformity in the preparation might be obtained. Every one to whom Mr. Hughes has submitted "Molascuit" has acknowledged its value both as a feeding stuff, and a new industry to the colony. Asked if planters could afford to use megass for this purpose in preference to utilizing it for fuel, he replied that only a very small proportion— and that the very finest part of the fibres—of megass was required in the preparation, and it should not interfere to any extent with the use of megass as fuel.

Mr. Hughes added that he was very hopeful of better times in store for the West Indies as the result of the action to be taken by the Home Government. His Majesty, the King, at the opening of Parliament, he said, would not have made the marked reference he did to the sugar colonies being "unfairly weighted" unless the Government had intended doing something to relieve their distress, and it was only a matter of time before we would be made aware of what these intentions are.—Dem. Argosy.

INFLUENCE OF FORESTS ON THE CLIMATIC CONDITIONS OF A COUNTRY.

Though it has been admitted in the first part of this introduction that the climate of each country and of each district is *prima facie* dependent upon its geographical position, its elevation, the configuration of the ground, and other cosmic causes which are independent of local circumstances it can hardly be denied that the existence or non-existence of large well-wooded areas in a country naturally capable of growing forests affects its climate in a very marked degree. History proves this to us in numerous instances where the deterioration of the climate of whole districts, and even of whole countries, has followe dthe destruction.

The once well-wooded Dalmatia is a stony desert; Persia once one of the granaries of the East is barren and desolate over a large extent of the country. North Africa, formerly one of the main corn markets of Rome, is subject to the severest droughts. Spain, Italy, Sicily, Greece and Asia Minor have suffered greatly from disforestation, and finally, but not least, India especially in the intermediate and dry zones in the Deccan, and in the northwest of the country has been injured by the destruction of her forests.

Even Oskar Peschel, who questions the importance of the influence of forest growth on the climate of a whole country perhaps more than any other writer of note, throws no doubt on the observations made by Boussingault, Humboldt, and Bompland, and acknowledges the local influence of forests on the precipitation of moisture. He says, however, and he has numerous followers even within the ranks of the Forest Department, that the amount of rain which falls year by year on the Continent would be exactly the same if there were no forests at all.

"The amount of rain," he states, "depends on the extent of oceans and seas, on the degree of heat, and on the rapidity with which the air moves over the surface of the waters. None of these conditions are changed," he writes, "by the extent or absence of forests. All air currents blowing from the sea are year by year charged with the same amount of moisture, which precipitates as soon as the air is cooled below the point of saturation. If such precipitation be caused by forests, the air currents reach the regions behind these forests drier and unable to yield a further supply of water."

It is thus Oskar Peschel teaches in his well known work "Neue Probleme der vergleichen den Edrkunde," but he entirely omits from his calculation re-evaporation of moisture precipitated on the land, and his conclusions cannot consequently be accepted. A well-wooded forest area may best be compared to a landlord who spends his income derived from the country within it and for the benefit of his neighbors

where as cleared areas resemble absentee proprietors who scatter their revenues in foreign parts. It rains; the drops are scattered on the leaves and fall in a soft gentle spray or in slow falling big drops, which have collected on the foliage on to the spongy forest ground. The water has thus time to perlocate slowly into the soil below, whence a large quantity is gradually pumped up again through the roots of the forest trees exhaled by their leaves and again assists in forming rain clouds. Wooded area, no doubt, extract under the same circumstances more moisture out of the air than for disforested regions, but they serve as a store-house and yield again what they take, whereas a great portion of the water precipitated on barren soil is only recovered by evaporation from rivers, lakes, and oceans. Forests use, therefore, much less moisture than barren areas in the same position and under similar conditions and augment the atmospheric moisture in regard to regions which are separated by such forests from the sea instead of diminishing it. Their action in this respect is not the same time as that of an intervening mountain range.

In a forest the water does not flow off with the same rapidity, and much of that which gravitates into the soil is pumped back by the long roots of the forest trees, and especially during the period of vegetation is exhaled by the leaves in quantities which represent far more than the moisture evaporated from the open ground. There can be no doubt, whatever may be said to the contrary, that the widely-spread notion that forests tend to increase the rainfall, and that in a warm country, diminishes its moisture, and consequently its fertility is correct. As already pointed out the theory is proved by history and ruins, and the rapidity with which changes in the climate of different countries have taken place entirely forbids that such sudden modifications should be ascribed to cosmic causes. We accept other scientific problems on much more flimsy evidence, but in this instance a large number of us suddenly swerve aside and follow a school which starts new theories on partial observations and leaves re-evaporation out of consideration. Ebermayer found from experiments made that during July, the hottest month in Bavaria, only 6 per cent which filtered down to the depth in a forest, the ground of which was covered with complete and undisturbed vegetable mould.

In the one case the water rapidly runs off into streams and seas by sudden floods and freshets, and this too when the whole atmosphere is surcharged with moisture. In the other instance the water is stored for re-evaporation through the foliage of the forests, and is given forth at the time when the air is drier and the winds do not blow from the sea. It may be safely stated that more than the rain which is thus stored in the ground is re-evaporated by the trees in time of

need, and even at this low computation a well-stocked, a well-protected forest area, the vegetable mould of which is undisturbed by either fire or the axe or rake of the "rab" or "sir" collector would re-supply to the atmosphere at least one-third of the moisture which is precipitated on it. This would be available for the open country. If therefore 30 per cent of the country was under complete forest, the rainfall should increase by 10 per cent under conditions similar to those which exist in Bavaria in July.

Forests can have no influence whatever on the amount of moisture drawn from the ocean, and the general direction of the winds is unquestionably governed by greater causes, but, apart from this, periodical rains are subject to the same general laws as all other rains, and must, therefore, be affected by the same causes, and amongst them by extensive forest growth, in exactly the same way and degree. The air may be charged with moisture which need not, however, be precipitated. If an extensive snowfall in the outer Himalayas can affect the monsoon rainfall, it seems certain that forests can do the same, though probably not to the same degree.—Forestry in British India.

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CONSERVING MOISTURE.

The most important problem presented to the gardener or planter is that of conservation of soil moisture. It matters not how careful he may be in the selection of varieties or in the application of fertilizer if the soil is lacking in moisture all will count for little or nothing. It is generally conceded that most soils contain plant-food in sufficient quantities for the production of the most bountiful crops for a number of years without any manurial supplements. But in most cases the plant-food is not in an available form and it must first become soluble before it can be used by plants. In this transformation moisture plays a most important part. Soil water is the medium for the carrying of the plant-food from the soil to the plant. The importance of soil moisture may be appreciated by the fact that the water evaporated from the soil during the time of the plant's growth amounts to over 300 times its weight. Moisture in the soil may be conserved by (1) humus, which may be done by plowing under of crops or by application of barnyard manure. (2) Underdrainage. (3) Application of lime. (4) Cultivation. The last is the most important as it is the most effective in the accomplishing of the desired ends. Regarding the importance of cultivation as a means of conserving the soil moisture Professor Blair says:

"It is a fact that the soil particles hold water in the form of a film on their surface. The surface area of these particles depends on their number or the fineness of the soil. This is readily seen by comparing a cubic foot of marbles 1 inch in

diameter with a cubic foot composed of particles one-thousandth of an inch in diameter. In the first we have an aggregate surface area, according to King, of 27.7 square feet, in the latter instance of 37,700 square feet. This pulverizing of the soil is secured by thorough and careful cultivation.

"But this increasing of the water holding capacity of the soil must be supplemented by a retentive force which will check capillarity at the surface of the soil. The water moves by capillary attraction to the surface where it is evaporated —explained in the same manner as the upward movement of oil in the lampwick or of ink in the blotting pad. By breaking up of these capillary spaces next the surface evaporation will be checked. In the same way a mulching of the surface prevents evaporation. This same operation having broken up the capillary pores conserves the moisture by checking evaporation. But it is useless to commence this checking process late in the season, when drought is already apparent. No amount of cultivation at this time can correct the fault which should have been prevented weeks before. The careful orchardist will cultivate early in the spring—or as soon as the land will permit it—repeating the operation at least once a week, unless frequent rains should make such an operation needless. As soon as a shower has passed and the land has become crusted and dry on top, the harrow should be put to work remaking this dust mulch.

"The mulch which man provides for the conservation of soil moisture by means of cultivation is only of a different form than that provided by nature for the same purpose which consists of leaves and decayed vegetable matter."—N. S. W. Ag. Gazette.

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THE SUGAR INDUSTRY IN JAMAICA.

By Herbert H. Cousins, M.A., F.C.S., Government Analyst and Agricultural Chemist, Jamaica, in Chemical Charge of Sugar Cane Experiments.

A century ago a seaboard of Jamaica was girdled with sugar estates, even places far from the sea and involving most laborious cartage were able to produce sugar and rum profitably. Lands and situations far from suitable for cane cultivation were brought into use, under the stimulus of high prices and limited production.

With the steady growth of the world's competition in sugar production, the full brunt of which has been borne by the British West Indies, a very different allocation of sugar areas now obtains in Jamaica. The seaboard girdle of sugar estates has vanished. On the north side St. Mary and Port have entirely abandoned the sugar cane for banana. St. Andrew

boasts but one estate, while the once famous sugar parish of St. Catherine has but 1,000 acres in cultivation.

Some 121 estates, representing 22,231 acres of canes, now exist. These average 184 acres each of cane cultivation—representing but one-ninth of the total area of the estates.

The average yield for Jamaica in a favorable year amounts to about a ton of sugar and three-quarters of a puncheon of rum per acre. These figures sum up the commercial aspect of the sugar industry as at present carried on in Jamaica. I now propose to consider each district seriatim, noting the special conditions and circumstances obtaining and suggesting some obvious means of improving the sugar prospects in each case.

The Westmoreland Hanover, and St. Elizabeth area should be marked out as one particularly favored by nature for sugar production. Although as regards the crop of 1899 it was surpassed by the Vere district in yield per acre, an examination of the crops return over a series of years would show that this district is far more uniform and consistent in production, and receives a more regular and more plentiful rainfall.

The soils vary greatly, both in consistency and in natural fertility. Some of the Westmoreland estates have to deal with decidedly poor lands, and high farming is necessary to get a reasonable stand of canes every year; drainage is also a practical difficulty in some instances. Other estates, however, rejoice in extremely fertile soil and can reap large crops of first-rate cane at a low cost of production per ton. From the figures published by Mr. P. Greg in the Journal of the Jamaica Agricultural Society for 1900, it would appear that the cost of growing canes in this district on two average estates was a little less than 6s. per ton delivered at the mill. Other planters have given me figures slightly lower than this, but the basis of calculation was not the weigh-bridge as in Mr. Greg's estimate.

A visitor to this district is struck by the signs of healthy development already appearing. Young men of brains and enterprise are here working away with faith in the future and confidence in the soundness of sugar under conditions of efficiency as regards crushing and manufacture.

It is gratifying to hear of a group of estates having freed itself of an enormous debt by less than a decade of thrifty and intelligent management, and of the establishment of a centralized factory.

Considerable interest has been shown by sugar managers in Jamaica in the new plant of machinery at Cornwall estate. Mr. W. Farquharson sends me the following figures as to crop obtained there:

Acres cut 172, canes 3,359 tons, average density 99 degrees B., tons of sugar 261, puncheons of rum 87 (10,466 gallons), tons of cane per ton of sugar 12.8, tons of cane per 'ton and puncheon' 9.6. The mills expressed 78 per cent. from plants

and first ratoons and 74 per cent. from second ratoons. This is an estate where cane is growing under difficulties, and yet has yielded an addition of quite 50 per cent. by the introduction of double crushing and evaporation in vacuo.

At Holland estate in St. Elizabeth is to be found a modern mill which gives an expression almost, if not quite, equal to the double crushing plant at Cornwall.

Efficient milling is the first watchword of the progressive planter in Jamaica. A conservative estimate would place the initial losses at 30 per cent. in the majority of Jamaica sugar estates. It would also seem that one good mill is better than two inferior mills crushing tandem.

Rum is the vital feature of the prosperity of several estates in this district. Some "German rums" of good reputation are produced and this has deterred several planters from installing a modern outfit for evaporation in vacuo. It is difficult to get up an esotaric enthusiasm for "German rum" since it is associated with mediaeval sugar management, is steeped in rule of thumb and at best is but an assistant to adulteration. Yet it pays, and in some cases is the sole mainstay of the estate. Looking at the matter broadly, I think it is an undoubted fact that "German rum" has prejudiced the sale value and public estimation of Jamaica rum. It also makes it impossible to protect the valuable asset of the name possessed by Jamaica rum, since certain Jamaica rums are undrinkable as such and serve solely to flavor multiple puncheons of continental potato spirit. I was much struck on going through some of the stillhouses in this and other districts to find the great variation in the yield of rum obtained from successive fermentations apparently carried out under identical conditions. If "rums can be improved from 2s. to 6s. per gallon" (H. S. Hoskins) the yield of ordinary "common clean" could certainly be increased 25 per cent. in most still-houses by ensuring uniformity of fermentation. This would mean a gain of £30,000 to £40,000 a year in the island's production of rum. It is to be hoped that it may soon be possible to apply to Jamaica rum those methods which have played so important a part in the modern breweries and distilleries of Britain and the Continent of Europe.

Central Factories are now being talked of here and would undoubtedly be a success. Mr. Greg has shown that an estate would be better off selling cane to a factory at 10s. per ton than yearly facing the troubles and risks of its own muscovado process. A profit of 4s. per ton would be such a sufficient agricultural return that enormous crops would be raised should a factory be started in any suitable neighborhood. A retreat Mr. W. Farquharson is doing this on a modest scale for the coming crop. A centralized factory is to be erected at Appleton estate and it is hoped that 1,000 acres will be planted here and the crop dealt with by a compact and well

organized modern plant. Holland, a former property of the Gladstone family, is an estate that is making a bold bid for success; 1,500 acres of flat, alluvial land are here available. Heroic methods in the way of trenches have worked wonders and we have not seen finer canes on any estate in the island.

Seedling canes have attracted a good deal of notice in this district. The results obtained have been very encouraging to the eye, in several instances, but no exact figures are at present available. Seedling trials in this district have been arranged by the Board of Agriculture and it is hoped that the results will lead us in the desired direction.

Fertilizers are little used at present. Trials are being made on two typical soils, and opinions as to the virtues of cowpeas vary, but most planters are of the opinion that they afford an excellent means of reinforcing the fertility of cane lands. Experiments to test this are on hand. The use of American plows and cultivators is extending, and there is a brisk demand for half-bred Indian cattle for draught purposes. A development of the sugar industry would immediately restore the shattered prospects of the penkeepers, and there has been a good deal of enterprise shown lately in the purchase of pure bred Indian stock for breeding purposes.

General Conclusions.—To improve the industry in this district the following points demand attention:

1. The establishment of "central" or, perhaps more practicable, of "centralized" factories.
2. Improved milling on individual estates and the abolition of the muscovado process where German rum is not a consideration.
3. A reorganization of the still-house routine. Chemical control of the liquor and the use of selected yeasts.
4. Improved drainage, more thorough cultivation, attention to the needs for green dressings and fertilizers.
5. Careful and systematic trials of seedling canes.
6. Employment of trained bookkeepers capable of carrying out a chemical control for ordinary factory purposes.

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EARTH WORMS.

Professor Henry Drummond says in one of his books:—"When we watch the farmer at work and think how he has to plow, harrow, manure, and humor the soil before even one good crop can be coaxed out of it, we are apt to wonder how nature manages to secure her crops and yet dispense with all these accessories. The world is one vast garden, bringing forth crops of the most luxuriant and varied kind, century after century, millennium after millennium. Yet the face of nature is nowhere furrowed by the plow; no harrow disintegrates the clods; no lime or phosphates are strewn upon its fields; no visible tillage improves the work on the

great world's farms. Now in reality there cannot be crops, or successions of crops, without the most thorough agriculture; and when we look more closely into nature we discover a system of husbandry of the most surprising kind. Nature does all things unobtrusively, and it is only now that we are beginning to see the magnitude of the secret agricultural operations by which she does already all that man would wish to imitate, and to which his most scientific methods are but clumsy approximations. In this great system of natural husbandry nature uses agencies, implements, and tools of many kinds. There is the disintegrating frost, the great natural harrow which bursts asunder the clods by the expansion during freezing of the moisture imprisoned in their pores. There is the communistic wind, which scatters broadcast over the fields the finer soil in clouds of summer dust. There is the rain, which washes the humus into the hollows and scrapes bare the rocks for further denudation. There is the air, which with its oxygen and carbonic acid, dissolves and decomposes the stubborn hills and manufactures out of them the softest soil of the valley. But this is not all, nor is this enough. To prepare a surface film however rich and to manure the soil beneath will secure one crop, but not a succession of crops. There must be a mixture and transference of these layers and a continued mixture and transference kept up from age to age. The lower layer of soil exhausted with bringing forth must be transferred to the top for a change of air, and there must be for a long time increasing its substance and recruiting its strength among the invigorating elements. The upper film restored, disintegrated, and saturated with fertility and strength, must next be slowly lowered down again to where the rootlets are lying in wait for it deep in the under soil. Now how is this last change brought about? Man turns up the crust with the plow, throwing up the exhausted earth and down the refreshed soil with infinite toil and patience. Nature does it by natural plowmen, who with equal industry are busy all over the world reversing the earth's crust, turning it over from year to year, only much more slowly and much more thoroughly, spade by spadeful, foot by foot, and even grain by grain. Before Adam delved the Garden of Eden these natural agriculturists were at work, millions and millions of them, all over the world at different seasons and in different ways tilling the world's fields. According to Mr. Darwin the animal which performs this most important function in nature is the earth worm. Mr. Darwin calculates that the whole soil of the country must pass through their bodies every few years. Some of this earth is brought up from a considerable depth beneath the surface, for in order to make it subterranean burrow the animal is compelled to swallow a certain quantity of earth. It eats its way, in fact, to the surface, and there voids the material in a little heap.

Although the proper diet of worms is decaying vegetable matter, dragged down from the surface in the form of leaves and tissues of plants, there are many occasions on which this source of ailment fails and the animal has then to nourish itself by swallowing quantities of earth for the sake of the organic substance it contains. In this way the worm has a two-fold purpose to throw up earth—first, to dispose of the material excavated from its burrows; and secondly, to obtain adequate nourishment in times of famine.

"'When we behold a turf-covered expanse,' says Mr. Darwin, 'it is a marvellous reflection that the whole of the superficial mould over any such expanse has passed and will pass every few years through the bodies of worms. The plow is one of the most ancient and valuable of man's inventions; but long before he existed the land was, in fact, regularly plowed by earth worms. It may be doubted whether there are many other animals which have played so important a part in the history of the world as have these lowly-organized creatures.'

"In the light of Professor Drummond's remarks no one is justified in saying that the worms rob the plants of food or of their presence being detrimental. Although worms may eat manure applied to plants and it may apparently be all gone, still I am confident that over 95 per cent. of it will still be there, but in an invisible form, and, what is more, in a form infinitely more adapted to the requirements of plant-life than in its previous state. In passing through the digestive organs of the worms it has become so finely-divided that it cannot be distinguished from the rest of the soil and being in this finely-divided state will yield up its manurial ingredients much more readily than if left to decay in the usual way. Now it may be argued that in their burrowings the earth worms may disturb the root system of the plant, which to a small extent they must do, but on the other hand let us take for example the common process of 'hilling up' potatoes, or the summer cultivation between growing crops. In these operations we must destroy thousands of rootlets, but the benefit which the plants derive through this stirring of the soil more than compensates them for the damage down to their roots. Again, it may be argued that in the process of digestion the worm may extract all that is useful from the manure. I think not. The horse or ox retain less than 4 per cent. of the manurial ingredients of the food supplied to them. The other 96 per cent., or more, eventually finds its way back to the land in the form of farmyard manure. This being the case, it seems only reasonable to suppose that an organism, which has neither animal heat to maintain, nor bone tissue to build up, would retain less still. Even supposing they did absorb some fair amount of its nourishment, what are they to do with it? They are fortunately not provided with wings that they might fly away with it. Their life is a short one, and

at the end of it they lay a few eggs to provide cultivators for next season, and then yield up their humble carcass to the soil in return for what little they may have borrowed from it."—*Jour. of Agriculture, South Australia.*

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HOW TO INCREASE THE SUGAR CONTENTS OF CANE.

(A paper by Mr. John E. Caldwell, read before the Louisiana Sugar Planters' Association, May 8th, 1902.)

In presenting this paper I beg that my hearers will not take these remarks as an evidence of bumptious conceit, but as an earnest suggestion that, if followed, may relieve the somewhat discouraging situation the cane planters are facing.

The desirability of increasing the sugar content of cane goes without saying, if it is to hold its place as a commercial proposition. The reason canes in tropical countries reach their high sugar contents, is because they have time to fully mature, aided by suitable soil, air and sunlight to convert their juices into sucrose. Now we have forced this cane from its natural habit of 14 to 20 months' growth to maturity into a plant taking just half this time. Now still further do we impose the burden upon this plant, robbing it of time to effect maturity by late planting, violently cutting its roots in cultivation and late working or "laying by."

Cane planted properly, in land deeply broken, should never thereafter be disturbed, especially by alleged cultivation, cutting all young roots by close off-barring. "Off-bar" of course in very early spring when scraping off dirt is in order, but never afterwards, for, while you may produce a good and large cane by the process it will, *ipso facto*, be low in sucrose.

This idea of producing a large, tall and dropsical cane, pale and sickly in color, with dirty furze on it, is vanity—a desire to make "tonnage." It is not a clear or proper understanding of the business.

The typical cane is bright, clear and deep in color, free from furze and usually small, hardly ever over 4¼ feet, cut for mill. It is riper, however, than the first described cane and will yield more sugar, both per acre or per ton, though the "tonnage" per acre be smaller. To produce cane of this type you must adjust the work of the plantation to the end that you give this cane a fair chance and time to grow. Take notice of this word "time;" it will be often used in this paper and on a plantation it is the all-important factor.

Now considering this cane is a plant of a tropical climate and we have by violent means robbed it of its native warmth and sunshine in our efforts to "benevolently assimilate" it, is it fair to expect it to yield to us its best fruits in sugar if we wantonly, carelessly and recklessly rob it of one of its prime essentials, which we will call "time?" For, whereas, in

its native habitat, it is planted in a warm bed, we plant it in a cold one, and whereas it gets 14 to 20 months to produce the sugar, we expect it to do it for us in one-half the time or seven to ten months. Therefore it would seem only justice and fair play that we give it a fair chance and time to the end that cane will then show us its capabilities and we be financially benefited. * * *

The writer in the '80's was overseering a small place and having some scattering cane, in which corn and peas were planted, and wishing to save the pea vines for hay, carefully prepared some land, cut these canes in September (8th and 10th) planted same one cane and a lap (planted thin to make a show, as place was on the market for sale). Greatly to his and everybody else's surprise and contrary to all the talent's predictions and expectations this piece of cane came up to a beautiful stand, cattle in the field grazed it down, it passed through a hard winter, producing a heavy crop of fine cane, very healthy and ripe, quite a phenomenal crop for this piece of land, which was rather poor. No fertilizers were used.

This good yield is accounted for on the hypothesis that this cane was given time to grow and mature its juices. All canes usually have juice enough, but for want of time, air and sunlight, do not convert same into sucrose when we want them for the mill.

Since this time the writer has himself tried this September planting and induced others to do so with uniformly good results. All having been done on a small scale however, without keeping record, and without means of analytical comparison, results cannot be given. This plan, however, it is hoped will be tried by some one or more who can keep tab on the matter and compare results. So endeth Chapter One.

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Readers of the Monthly will find this issue a very interesting and instructive one, relative to matters in which cane planters are specially concerned. So little has been heard of the results of Dr. Maxwell's work in Queensland since he left Hawaii, that the item referring to his success in increasing the out put of sugar per acre in some localities from one to ten tons—will be read with interest. The details of his work there will probably soon be given in an official report.——The brief article on the Brussels Convention, referring to the work done in it, is the clearest statement yet received here. The Convention does not go into full operation until September, 1903.——It is a credit to Hawaii that one of the most valuable and successful of recent discoveries made in the manufacture of sugar—the filtration of sugar juice and syrups with sand—was discovered or rather its first successful application was made here in Hawaii by Manager Ahrens of the Oahu Sugar Mill. This method is being very rapidly introduced into all Sugar Mills throughout the world—a very high compliment to its discover and to Hawaii.

HONOLULU STOCK AND BOND EXCHANGE, JULY 15, 1902.

STOCK	Capital Authorized	Shares Issued	Capital Paid up	Par Value	Last Sale
MERCANTILE					
C. Brewer & Co	$ 1,000,000	10,000	$ 1,000,000	$ 100	375
N. S. Sachs' Dry G'ds Co. L'd.	60,000	600	.....	100	100
L. B. Kerr & Co., Ltd	200,000	4,000	.....	50	
SUGAR					
Ewa Plantation Company	5,000,000	250,000	5,000,000	20	24
Hawaiian Agricultural Co	1,000,000	10,000	1,000,000	100	270
Hawaiian Com'l & Sugar Co.	10,000,000	100,000	2,312,750	100	33½
Hawaiian Sugar Company	2,000,000	100,000	2,000,000	20	23
Honomu Sugar Company	750,000	7,500	750,000	100	130
Honokaa Sugar Company	2,000,000	100,000	2,000,000	20	11
Haiku Sugar Company	500,000	5,000	500,000	100	.....
Kahuku Plantation Company	500,000	25,000	500,000	20	23¼
Kihei Plant. Co. Ltd.,	2,500,000	50,000	2,500,000	50	10
Kipahulu Sugar Company	160,000	1,600	160,000	100	....
Koloa Sugar Company	500,000	5,000	500,000	100	164
McBryde Sug. Co. Ltd.	3,500,000	175,000	3,500,000	20	5
Oahu Sugar Co	3,600,000	36,000	3,600,000	100	87½
Onomea Sugar Co	1,000,000	50,000	1,000,000	20	24½
Ookala Sugar Plantation Co.	500,000	25,000	500,000	20	8
Olaa Sugar Co. Ltd., Assess.	2,500,000	125,000	865,000	20	3¾
Olaa Sugar Co. Ltd., Paid up	2,500,000	125,000	2,500,000	20	9¾
Olowalu Company	150,000	1,500	150,000	100	.....
Paauhau Sug. Plantation Co.	5,000,000	100,000	5,000,000	50	12
Pacific Sugar Mill	500,000	5,000	500,000	100	.....
Paia Plantation Company	750,000	7,500	750,000	100	250
Pepeekeo Sugar Company	750,000	7,500	750,000	100	.....
Pioneer Mill Company	2,250,000	22,500	2,250,000	100	60
Waialua Agricultural Co	4,500,000	45,000	4,500,000	100	58
Wailuku Sugar Company	700,000	7,000	700,000	100	300
Waimanalo Sugar Company	250,000	250,000	250,000	100	160
Waimea Mill Company	125,000	125,000	125,000	100	87
MISCELLANEOUS					
Wilder Steamship Company	500,000	5,000	500,000	100	100
Inter-Island Steam Nav. Co.	600,000	6,000	600,000	100	100
Hawaiian Electric Company	500,000	5,000	500,000	100	87½
Honolulu R. T. & Land Co.	250,000	2,500	250,000	100	65
Mutual Telephone Company	150,000	13,900	139,000	10	10
Oahu Railway & Land Co	4,000,000	40,000	4,000,000	100	90
BANKS					
First National Bank	500,000	5,000	500,000	100	.....
First Am. Sav. B. & Trust Co.	250,000	2,500	250,000	100	.....
BONDS	Amt. of Issue				
Hawaiian Govt. 5 per cent	1,251,200	Dec. 31, 1900	.....	.....	97½
Hilo Railroad Co., 6 per cent	1,000,000	750,000	.....	.....	.....
Hono. R. T. & L. Co, 6 p. c.	300,000	.....	.....	.....	100
Ewa Plantation 6 per cent	500,000	.....	.....	.....	101½
Oahu Railway & L'd Co 6 p. c.	2,000,000	.....	.....	.....	104½
Oahu Plantation 6 per cent.	750,000	.....	.....	.....	100
Olaa Plantation 6 per cent	1,250 000	.....	.....	.....	.....
Waialua Agr. 6 per cent	1,000,000	.....	.....	.....	.....

PLANTATION DIRECTORY.

Island and Name.		Manager.	Post Office
OAHU.			
EwaPlantation Co	*	G. F. Renton	Honouliuli
Waianae Sugar Co. Ltd	***	Fred Meyer	Waianai
Wailalua Agricultural Co	*	W. W. Goodale	Wailalua
Kahuku Plantation Co	xx	Andrew Adams	Kahuku
Waimanalo Sugar Co	**	G. C. Chalmers	Waimanalo
Oahu Plantation Co	x	Aug. Ahrens	Waipahu
Honolulu Sugar Co	**	J. A. Low	Aiea
Heeia Agricultural Co. Ltd	*x*	W. W. McGowan	Heeia
Laie Plantation	x*x	S. E. Wooley	Laie
MAUI.			
Olowalu Sugas Co	**	E. Kruse	Lahaina
Pioneer Mill Co	x	L. Barckausen	Lahaina
Wailuku Sugar Co	**x	C. B. Wells	Wailuku
Hawaiian Commercial & Sugar Co	x*	H. P. Baldwin	Spreckelsville
Paia Plantation	x*	D. C. Lindsay	Paia
Haiku Sugar Co	x*	H. A Baldwin	Hamakuapoko
Hana Plantation	xx	K. S. Gjerdrum	Hana
Kipahulu Sugar Co	x	A. Gross	Kipahulu
Kihei Plantation	x*	James Scott	Kihei
Maui Sugar Co	* *	J. R. Myers	Puelo
HAWAII.			
Paauhau Plantation	**	Jas. Gibb	Honokaa
Hamakua Mill Co	*x	A. Lidgate	Paauilo
Kukaiau Plantation	x	J. M. Horner	Paauilo
Kukaiau Mill Co	*x	E. Marden	Paaulio
Ookala Sugar Co	o*x	W. G. Walker	Ookala
Laupahoehoe Sugar Co	*x	C. McLennan	Papaaloa
Hakalau Plantation	**	Geo. Ross	Hakalau
Honomu Sugar Co	**x	Wm. Pullar	Honomu
Pepeekeo Sugar Co	*x	H. Deacon	Pepeekeo
Onomea Sugar Co	**x	J. T. Moir	Papaikou
Hilo Sugar Co	**	J. A. Scott	Hilo
Hawaii Mill Co	x	W. von Gravemeyer	Hilo
Waiakea Mill Co	*x	C. C. Kennedy	Hilo
Hawaiian Agricultural Co	**x	C. M. Walton	Pahala
Hutchinson Sugar Plantation Co	**	G. C. Hewitt	Naalehu
Union Mill Co	*x	Jas. Renton	Kohala
Kohala Sugar Co	*	E. E. Olding	Kohala
Pacific Sugar Mill	x**	D. Forbes	Kukuihaele
Honokaa Sugar Co	x**	Jno. Watt	Honokaa
Kona Sugar Co	xxx	J. Cowan	Holualoa
Olaa Sugar Co	xx*	F. B. McStocker	Olaa
Puna Sugar Co	xx*	W. H. Campbell	Kapoho
Halawa Plantation	x*x	P. S Kay	Kohala
C. F. Hart, (Niulii)	*x	R. Hall	Kohala
Hawi Mill & Plantation	††	John Hind	Kohala
KAUAI.			
Kilauea Sugar Co	**	G. R. Ewart	Kilauea
Gay & Robinson	x*x	Gay & Robinson	Makaweli
Makee Sugar Co	**x	G. H. Fairchild	Kealia
Grove Farm Plantation	x	G. N. Wilcox	Lihue
Lihue Plantation Co	x	F. Weber	Lihue
Koloa Sugar Co	x	P. McLain	Koloa
McBryde Sugar Co	*x	W. Stodart	Eleele
Hawaiian Sugar Co	x*	W. A. Baldwin	Makaweli
Waimea Sugar Mill Co	*	J. Fassoth	Waimea
Kekaha Sugar Co	x	H. B. Faye	Kekaha

Key	Honolulu Agents
*	Castle & Cooke (4)
**	W. G. Irwin & Co (8)
***	J. M. Dowsett (1)
x	H. Hackfeld & Co (9)
xx	M. S. Grinbaum & Co (2)
xxx	McChesney & Sons (1)
*x	T. H. Davies & Co (8)
**x	C Brewer & Co (7)
x*	Alexander & Baldwin (5)
x**	F. A. Schæfer & Co. (3)
xx*	B. F. Dillingham & Co (2)
x*x	H. Waterhouse & Co (3)
x	C. Bolte (1)
††	Hind, Rolph & Co (1)